

# Novell® Nterprise™ Linux® Services

COURSE 3015

Novell Training Services

[www.novell.com](http://www.novell.com)

INSTRUCTOR GUIDE

Volume 2

**Novell®**

---

## Proprietary Statement

Copyright © 2004 Novell, Inc. All rights reserved.

No part of this publication may be reproduced, photocopied, stored on a retrieval system, or transmitted without the express prior consent of the publisher. This manual, and any portion thereof, may not be copied without the express written permission of Novell, Inc.

Novell, Inc.  
1800 South Novell Place  
Provo, UT 84606-2399

## Disclaimer

Novell, Inc. makes no representations or warranties with respect to the contents or use of this manual, and specifically disclaims any express or implied warranties of merchantability or fitness for any particular purpose.

Further, Novell, Inc. reserves the right to revise this publication and to make changes in its content at any time, without obligation to notify any person or entity of such revisions or changes.

Further, Novell, Inc. makes no representations or warranties with respect to any NetWare software, and specifically disclaims any express or implied warranties of merchantability or fitness for any particular purpose.

Further, Novell, Inc. reserves the right to make changes to any and all parts of NetWare software at any time, without obligation to notify any person or entity of such changes.

This Novell Training Manual is published solely to instruct students in the use of Novell networking software. Although third-party application software packages are used in Novell training courses, this is for demonstration purposes only and shall not constitute an endorsement of any of these software applications.

Further, Novell, Inc. does not represent itself as having any particular expertise in these application software packages and any use by students of the same shall be done at the students' own risk.

## Software Piracy

Throughout the world, unauthorized duplication of software is subject to both criminal and civil penalties.

If you know of illegal copying of software, contact your local Software Antipiracy Hotline.

For the Hotline number for your area, access Novell's World Wide Web page at <http://www.novell.com> and look for the piracy page under "Programs."

Or, contact Novell's anti-piracy headquarters in the U.S. at 800-PIRATES (747-2837) or 801-861-7101.

## Trademarks

Novell, Inc. has attempted to supply trademark information about company names, products, and services mentioned in this manual. The following list of trademarks was derived from various sources.

### Novell, Inc. Trademarks

NetWare, the N-Design, and Novell are registered trademarks of Novell, Inc. in the United States and other countries. CNA, CDE, CNI, NAEC, and Novell Authorized Education Center are service marks and CNE is a registered service mark of Novell, Inc. in the United States and other countries. ConsoleOne, DirXML, and eDirectory are trademarks of Novell, Inc. GroupWise is a registered trademark of Novell, Inc. Hot Fix and IPX is a trademark of Novell, Inc. NDS, Novell Directory Services and NDPS are registered trademarks of Novell, Inc. NetWire is a registered service mark of Novell, Inc. in the United States and other countries. NLM and Novell Certificate Server are trademarks of Novell, Inc. Novell Client, Novell Cluster Services, and Novell Distributed Print Services are trademarks of Novell, Inc. ZENworks is a registered trademark of Novell, Inc.

### Other Trademarks

Adaptec is a registered trademark of Adaptec, Inc. AMD is a trademark of Advanced Micro Devices. AppleShare and AppleTalk are registered trademarks of Apple Computer, Inc. ARCServ is a registered trademark of Cheyenne Software, Inc. Btrieve is a registered trademark of Pervasive Software, Inc. EtherTalk is a registered trademark of Apple Computer, Inc. Java is a trademark or registered trademark of Sun Microsystems, Inc. in the United States and other countries. Linux is a registered trademark of Linus Torvalds. LocalTalk is a registered trademark of Apple Computer, Inc. Lotus Notes is a registered trademark of Lotus Development Corporation. Macintosh is a registered trademark of Apple Computer, Inc. Netscape Communicator is a trademark of Netscape Communications Corporation. Netscape Navigator is a registered trademark of Netscape Communications Corporation. Pentium is a registered trademark of Intel Corporation. Solaris is a registered trademark of Sun Microsystems, Inc. The Norton AntiVirus is a trademark of Symantec Corporation. TokenTalk is a registered trademark of Apple Computer, Inc. Tru64 is a trademark of Digital Equipment Corp. UNIX is a registered trademark of the Open Group. WebSphere is a trademark of International Business Machines Corporation. Windows and Windows NT are registered trademarks of Microsoft Corporation.

# Contents

## Course Setup

Setup Requirements .....	Setup-1
Setup Diagram .....	Setup-3
Setup Instructions for the Classroom Computers .....	Setup-7
Install and Configure DA1 .....	Setup-8
Install and Configure DA2 .....	Setup-27
Install and Configure Student Servers .....	Setup-38
Install and Configure Windows XP on the Instructor and Student Workstations ...	Setup-46
Configure the Classroom Printer .....	Setup-48

## Introduction

Audience .....	Intro-1
Certification and Prerequisites .....	Intro-2
Linux Distributions .....	Intro-2
NNLS and Web Browser Support .....	Intro-3
NNLS Licensing .....	Intro-3
NNLS Online Resources .....	Intro-4
Agenda .....	Intro-5
eDirectory Tree and Server .....	Intro-6
Exercise Conventions .....	Intro-6

## SECTION 1 Explore the Linux Environment

Objectives .....	1-1
Objective 1 Describe the Characteristics of Linux .....	1-2
A Brief History of Linux .....	1-2
The Role of Linux .....	1-3
Working with Linux Distributions .....	1-5
Working with the Linux File System .....	1-6
Objective 2 Use the Linux Command Line Interface .....	1-12
Using the Linux Shell .....	1-12
Running Commands .....	1-13
Exercise 1-1 Working with the Linux Command Line .....	1-17

---

Objective 3	Manage the Linux File System . . . . .	1-19
	Default Linux Directories . . . . .	1-20
	Using Common File System Utilities . . . . .	1-21
	Mounting CDs or Floppies . . . . .	1-22
	Working with Archive Files . . . . .	1-24
	Exercise 1-2 Working with File System Commands . . . . .	1-26
	Working with File System Security . . . . .	1-28
	Editing Text Files . . . . .	1-35
	Exercise 1-3 Edit Text Files and Manage Permissions. . . . .	1-39
Objective 4	Manage Linux Applications. . . . .	1-41
	Installing Packages . . . . .	1-41
	Starting and Stopping Services . . . . .	1-45
	Managing Processes . . . . .	1-48
	Exercise 1-4 Install Mozilla 1.5 . . . . .	1-50
Objective 5	Manage Linux Network Interfaces . . . . .	1-53
	Configuring Network Interfaces from the Command Line . . . . .	1-53
	Configuring Network Interfaces from Red Hat . . . . .	1-55
	Configuring Network Interfaces from SuSE . . . . .	1-56
	Exercise 1-5 Configuring Network Parameters . . . . .	1-59
	Summary . . . . .	1-67
<b>SECTION 2</b>	<b>Install and Upgrade Novell Nterprise Linux Services</b>	
	Objectives . . . . .	2-1
	Introduction . . . . .	2-1
Objective 1	Describe Novell Nterprise Linux Services (NNLS) . . . . .	2-3
	Identity Services . . . . .	2-4
	Personal File Management Services . . . . .	2-6
	Print Services . . . . .	2-8
	Messaging and Calendaring Services . . . . .	2-9
	Web Experience . . . . .	2-9
	Resource Management Services . . . . .	2-11
	Web-Based Administration . . . . .	2-11
Objective 2	Perform an NNLS Installation . . . . .	2-13
	How to Obtain NNLS Software and Licenses . . . . .	2-13
	How to Prepare for an NNLS Installation . . . . .	2-14
	How to Install NNLS . . . . .	2-35
	How to Recover From a Failed Apache Process Start . . . . .	2-42

	Exercise 2-1 Install NNLS Services on Linux . . . . .	2-43
	Understand NNLS File and Data Locations . . . . .	2-57
	How to Uninstall NNLS Components . . . . .	2-59
	Install NNLS Components After Initial Installation . . . . .	2-60
	How to Configure SLP on Your Linux Server . . . . .	2-60
Objective 3	Manage NNLS with Red Carpet . . . . .	2-64
	Red Carpet NNLS Components . . . . .	2-65
	How to Manage RCD Groups with iManager . . . . .	2-67
	How to Manage NNLS Products with iManager . . . . .	2-70
	How Red Carpet Is Implemented in NNLS . . . . .	2-76
	Exercise 2-2 Use Red Carpet to Update Your NNLS Installation . . . . .	2-77
	Summary . . . . .	2-79
<b>SECTION 3</b>	<b>Provide Directory Services with eDirectory</b>	
	Objectives . . . . .	3-1
	Introduction . . . . .	3-1
	Describe the Purpose of eDirectory . . . . .	3-2
	What a Full-Service Directory Provides . . . . .	3-2
	The Role of eDirectory . . . . .	3-4
Objective 1	Describe How eDirectory Works. . . . .	3-5
	eDirectory Tree Architecture . . . . .	3-5
	How eDirectory Uses Foundation Services . . . . .	3-8
	Exercise 3-1 Explore Your eDirectory Tree with iManager. . . . .	3-27
	eDirectory and LDAP . . . . .	3-31
	Exercise 3-2 Import an LDIF File. . . . .	3-45
Objective 2	Perform eDirectory Administration Tasks . . . . .	3-48
	Command Line Utilities . . . . .	3-48
	How to Start and Stop eDirectory on Linux . . . . .	3-51
	Where eDirectory Files Are Located . . . . .	3-53
	Novell iManager . . . . .	3-54
	Novell iMonitor . . . . .	3-55
	How to Perform a Health Check in iMonitor . . . . .	3-63
	Exercise 3-3 Verify Your Server and eDirectory Status. . . . .	3-74
	Summary . . . . .	3-80

**SECTION 4    Manage User Identities with NNLS**

	Objectives .....	4-1
Objective 1	Manage User Objects with iManager .....	4-1
	How to Create User Objects .....	4-2
	How to Modify User Objects .....	4-3
	How to Move Objects .....	4-5
	How to Delete User Objects .....	4-7
	Exercise 4-1 Manage User Objects .....	4-9
	How to Extend the eDirectory Schema with an Auxiliary Class .....	4-14
	Exercise 4-2 Create an Auxiliary Class .....	4-19
Objective 2	View User Information with eGuide .....	4-21
	The Features of eGuide .....	4-21
	How to Access the eGuide Client .....	4-23
	How to Configure eGuide for LDAP .....	4-24
	Exercise 4-3 Set Up and Access eGuide .....	4-26
Objective 3	Access a Linux Server with Linux User Management (LUM) .....	4-30
	What LUM Is .....	4-31
	LUM Components .....	4-32
	eDirectory LUM Objects .....	4-33
	User Accounts .....	4-34
	Group Accounts .....	4-34
	How to Configure LUM .....	4-34
	How to Perform Basic LUM Tasks .....	4-38
	Exercise 4-4 Implement LUM in Your Container .....	4-48
	Summary .....	4-54

**SECTION 5    Synchronize User Identities with NNLS**

	Objectives .....	5-1
	Introduction .....	5-1
Objective 1	Describe the Purpose of DirXML .....	5-2
	What DirXML Is .....	5-3
	How DirXML Helps Enterprises Solve Data Synchronization Tasks .....	5-5
Objective 2	Describe How DirXML Works .....	5-8
	DirXML Architecture .....	5-9
	DirXML Data Processing Components .....	5-15
	Associations .....	5-35
	DirXML Objects in eDirectory .....	5-39
	Exercise 5-1 Confirm Installation of the DirXML Starter Pack on Your NNLS Server ...	5-41

Objective 3	Install the DirXML Starter Pack on Linux . . . . .	5-43
	What the DirXML Starter Pack Is . . . . .	5-43
	How to Install the DirXML Starter Pack on Your Linux Server . . . . .	5-45
Objective 4	Implement the Delimited Text Driver for DirXML . . . . .	5-48
	How the DirXML Driver for Delimited Text Works . . . . .	5-48
	How to Create and Start the DirXML Driver for Delimited Text . . . . .	5-52
	Exercise 5-2 Install and Test Your Delimited Text Driver . . . . .	5-57
Objective 5	Implement the eDirectory Driver for DirXML . . . . .	5-71
	How the DirXML Driver for eDirectory Works . . . . .	5-71
	How to Create and Configure the DirXML Driver for eDirectory . . . . .	5-74
	Exercise 5-3 Install and Test Your eDirectory Driver . . . . .	5-83
	Summary . . . . .	5-108
<b>SECTION 6</b>	<b>Provide Personal File Management Services with NNLS</b>	
	Objectives . . . . .	6-1
	Introduction . . . . .	6-1
Objective 1	Describe the Purpose and Architecture of iFolder . . . . .	6-2
	iFolder Benefits . . . . .	6-3
	iFolder Features . . . . .	6-6
	iFolder Components . . . . .	6-8
	iFolder Architecture . . . . .	6-10
Objective 2	Install and Configure iFolder . . . . .	6-15
	Prerequisites for Installing on Linux Servers . . . . .	6-16
	How to Install iFolder from NNLS . . . . .	6-18
	Exercise 6-1 Confirm the iFolder 2.1 Installation on Your NNLS Server . . . . .	6-23
	How to Configure Your iFolder Server . . . . .	6-24
	How to Access the iFolder Web Sites . . . . .	6-31
	How to Install and Configure the iFolder Client . . . . .	6-34
	How to Manage iFolder User Accounts . . . . .	6-39
	How to Manage iFolder Servers . . . . .	6-50
	How to Manage LDAP Servers . . . . .	6-55
	How to Monitor Your iFolder System . . . . .	6-57
	How to Generate Reports . . . . .	6-58
	Exercise 6-2 Configure and Test iFolder . . . . .	6-60
Objective 3	Describe the Purpose and Architecture of Samba . . . . .	6-70
	What Server Message Block (SMB) Is . . . . .	6-70
	What Common Internet File System (CIFS) Is . . . . .	6-70
	Samba and NNLS . . . . .	6-71

Objective 4	Install and Configure Samba . . . . .	6-72
	Steps for Installing Samba . . . . .	6-73
	Exercise 6-3 Confirm That Samba is Installed on Your NNLS Server . . . . .	6-77
	How to Configure Samba . . . . .	6-77
	How to Access Files Through Samba . . . . .	6-83
	Exercise 6-4 Configure Samba for Digital Airlines Employee Access . . . . .	6-87
Objective 5	Describe the Role and Function of NetStorage . . . . .	6-93
	NetStorage Benefits . . . . .	6-94
	How NetStorage Works . . . . .	6-94
	What Users See When They Access NetStorage . . . . .	6-96
Objective 6	Install and Configure NetStorage . . . . .	6-99
	Steps for Installing NetStorage . . . . .	6-99
	Creating Storage Location Objects and Lists . . . . .	6-102
	Accessing NetStorage Files and Folders . . . . .	6-106
	Configuring NetStorage . . . . .	6-108
	Exercise 6-5 Configure and Test NetStorage . . . . .	6-111
	Summary . . . . .	6-119
<b>SECTION 7</b>	<b>Manage Printers with NNLS</b>	
	Objectives . . . . .	7-1
	Introduction . . . . .	7-1
Objective 1	Identify the Benefits of iPrint . . . . .	7-2
Objective 2	Describe How iPrint Works . . . . .	7-3
	iPrint Manager . . . . .	7-4
	iPrint Driver Store . . . . .	7-6
	iPrint Client . . . . .	7-7
	iPrint Map Designer . . . . .	7-9
Objective 3	Install and Configure iPrint . . . . .	7-9
	Install iPrint on a Linux Server . . . . .	7-10
	Install the iPrint Client on a Windows Workstation . . . . .	7-13
	Create and Start a Driver Store . . . . .	7-14
	Add Printer Drivers to Your Driver Store . . . . .	7-14
	Create and Start the iPrint Manager . . . . .	7-15
	Create Your Printer Objects . . . . .	7-16
	Configure Your Network for Workstation and/or User Printers . . . . .	7-17
	Create Location-Based Printing Web Pages . . . . .	7-18
Objective 4	Print with iPrint . . . . .	7-24
	Use Printer Lists . . . . .	7-24
	Use Maps for Location-Based Printing . . . . .	7-25



---

	Exercise 7-1 Install and Configure iPrint .....	7-27
	Summary .....	7-35
<b>SECTION 8</b>	<b>Provide Web Mail Access with NNLS</b>	
	Objectives .....	8-1
	Introduction .....	8-1
Objective 1	Identify NetMail Features .....	8-2
Objective 2	Describe NetMail Components .....	8-4
	Internet Services Container .....	8-5
	Messaging Server .....	8-6
	Parent Objects .....	8-8
	Templates .....	8-9
	List Servers and Mailing Lists .....	8-11
	NetMail Agents .....	8-13
	Installation Directories .....	8-25
	WebAdmin .....	8-25
Objective 3	Describe How NetMail Works. ....	8-26
	Changes Made to Existing Objects .....	8-26
	How Messages Are Processed .....	8-27
Objective 4	Install NetMail .....	8-39
	Design Your NetMail System .....	8-39
	Meet System Requirements .....	8-41
	Gather Required Information .....	8-43
	Use the NNLS Install Feature .....	8-44
Objective 5	Configure and Use NetMail .....	8-45
	Running WebAdmin .....	8-45
	Configuring the Contexts Serviced by the NMAP Agent .....	8-46
	Selecting a Web Interface Template .....	8-47
	Exercise 8-1 Configure and Test NetMail for Your Digital Airlines Office .....	8-49
	Summary .....	8-52

**SECTION 9 Unify NNLS Web Access with Virtual Office**

	Objectives .....	9-1
	Introduction .....	9-1
Objective 1	Describe Virtual Office .....	9-2
	How Virtual Office Works .....	9-3
	Virtual Office Sample Scenarios .....	9-5
Objective 2	Install Virtual Office .....	9-6
	Meet Virtual Office Dependencies .....	9-7
	Gather Required Information .....	9-8
	Use the NNLS Install Feature .....	9-9
	Locate Virtual Office Files .....	9-10
Objective 3	Configure Virtual Office .....	9-10
	Managing the Virtual Office Configuration in iManager .....	9-11
	Managing Virtual Office in the Virtual Office Home Page .....	9-32
	Exercise 9-1 Configure and Use Virtual Office .....	9-50
	Summary .....	9-56

**SECTION 10 Prepare for the Novell CLE Practicum**

Scenario 1: Install NNLS (Required).....	10-2
Scenario 2: Business Requirements Document 1 .....	10-3
Scenario 3: Business Requirements Document 2 .....	10-4
Scenario 4: Business Requirements Document 3 .....	10-6

**APPENDIX A Directory Fundamentals**

What a Directory Is .....	A-1
Challenges That a Directory Service Should Address .....	A-2
Common Directory Service Uses .....	A-6
Key Components of a Basic Directory .....	A-8

## SECTION 6 Provide Personal File Management Services with NNLS

In this section you learn how to implement Novell® Nterprise™ Linux® Services (NNLS) personal file management services with iFolder®, NetStorage, and Samba.

### Objectives

1. Describe the Purpose and Architecture of iFolder
2. Install and Configure iFolder
3. Describe the Purpose and Architecture of Samba
4. Install and Configure Samba
5. Describe the Role and Function of NetStorage
6. Install and Configure NetStorage

### Introduction

Most users work on more than one computer to create, manage and use their personal files. However, accessing, storing, managing, and synchronizing those files on all these different computers (with possibly different platforms) can be a major task.

Novell Nterprise Linux Services provides the following file services from a Linux server:

- **Novell iFolder.** This product provides access, storage, and synchronization of files between a workstation and a central iFolder server.
- **NetStorage.** This product provides secure Internet-based access to files and folders on a Linux server in your network through a browser.
- **Samba.** This product provides Windows®-compatible file sharing using Microsoft's® SMB/CIFS networking protocols.

In this section, you learn how iFolder, NetStorage, and Samba can help you provide network file access and management solutions.

## **Objective 1    Describe the Purpose and Architecture of iFolder**

Novell iFolder is a Net services software solution that lets mobile professionals access their local files from anywhere—online, offline, all the time—across multiple workstations and the Net.

iFolder automatically and intelligently updates your files across desktop computers, laptops, and other connected devices you use, letting you use them wherever you happen to be—at the office, at home, or in a hotel.

All the you need is an active network or Internet connection and the iFolder client, a Web browser, or NetDrive.

For a user, iFolder is like having a single, virtual work folder accessible from any computer. It provides a simple, convenient, and secure way to access, back up, and synchronize files.

When connected to the iFolder server, iFolder automatically backs up the work done on local files to an account on the iFolder server. Files are always protected and easily recovered in the event the local data is lost.

If the user moves on to a different location and a different computer, iFolder automatically synchronizes those files to reflect the work completed elsewhere—with no manual disk copies or file transfers required.

To describe the purpose and architecture of iFolder, you need to know the following:

- iFolder Benefits
- iFolder Features
- iFolder Components
- iFolder Architecture

### ***iFolder Benefits***

Analysts agree that up to 80% of a company's business-critical data resides on PCs (desktops and laptops), not networked storage.

However, up to 96% of all business PCs are not being backed up (Strategic Research Corporation).

According to IDC

- The mobile work force in the U.S., Western Europe and Latin America is expected to grow from 34.7 million in 2001 to 60.8 million in 2004.
- 35% of PCs sold to business organizations are laptops.

With the lack of local data backup and expanding mobile work forces, companies need a product that provides easy access to personal files stored on the network and a system that automatically synchronizes those files from any location.

iFolder addresses those needs (and others) for the enterprise and the user. It provides the following benefits:

- **Seamless data access.** iFolder stores and synchronizes users' work in such a way that no matter what client or what location they log in from, their files are available and in the condition that they expect them to be.
- **Data safeguards and data recovery.** When a user saves a file locally, the iFolder client can automatically update data to the iFolder server where it immediately becomes available for an organization's regular network backup operations.

iFolder also gives Internet Service Providers (ISPs) the ability to offer a user-trusted backup solution for their customers' critical business or personal data.

- **Reliable data security.** With iFolder encryption, stored data is secure from unauthorized network access.

iFolder encrypts all data before it moves it across the Internet and stores it on the Novell iFolder server, keeping it out of the hands of unauthorized users.

- **Productive mobile users.** iFolder does away with version inconsistency, making it simple for users to access the most up-to-date version of their documents from any connected desktop, laptop, or Web browser.

In preparation to travel or work from home, users no longer have to copy needed data to their laptops from various desktop and network locations.

The iFolder client can automatically update users' laptops and desktops with the most current versions of their files. Even if a user loses a laptop, all those files can still be accessed with any computer connected to the Internet.

- **Cross-platform support.** The iFolder server integrates with either the Apache Web server on NetWare® and Linux or the Microsoft Internet Information Servers (IIS) Web server on Windows 2000.

Additionally, the iFolder's LDAP support for user authentication lets you leverage Novell eDirectory™ on NetWare, Linux, and Windows 2000 servers, or Microsoft Active Directory™ on Windows 2000 servers.

- **Simple data and account management.** iFolder is designed to allow for easy setup and management by network administrators.

The iFolder server can be managed from any location using a standard Web browser. With its automatic file updates, synchronization, and encryption, iFolder also frees up IT departments from routine maintenance tasks.

Network administrators also have the option to manage Novell iFolder accounts using eDirectory or Microsoft Active Directory (on Windows 2000 servers only).

- **Large-scale deployment.** One of the key features of iFolder is its ability to scale to a large and growing environment. You can install iFolder on multiple servers, allowing your iFolder environment to grow with your business.

There is no practical limit to the number of iFolder servers that you can have in your iFolder network—a single iFolder server handles up to 10,000 user accounts. In turn, each of these servers together acts as 1 system.

Because iFolder takes care of redirecting user authentication requests to the correct iFolder server, the login procedure is a seamless experience for the user.

Plus, as your iFolder network grows, your management costs stay the same, because the management of all iFolder servers is centralized through the iFolder Management console.

- **Benefits for users.** Novell iFolder provides the following benefits to users:
  - Guards against local data loss by automatically backing up your local files to the iFolder server and your multiple workstations.
  - Automatically updates files across the machines you regularly use (work, laptop, home) making the view of data the same on all machines.
  - Lets you keep files in a local directory (such as My Documents), so you use them the same way you always have.
  - Lets you access your files anywhere on the road using a web browser.
  - Tracks and logs changes made while you work offline and synchronizes those changes when you go online.
  - With encryption enabled, protects data as it travels across the wire and while stored on the iFolder server.

### ***iFolder Features***

In addition to the benefits provided by iFolder, the following are key features that make iFolder an effective personal file access and synchronization service:

- Support for the following network operating systems:
  - NetWare 5.1 with Support Pack 5 or later
  - NetWare 6.0 with Support Pack 2 or later
  - NetWare 6.5 or later
  - Microsoft Windows 2000 Server with Service Pack 3 or later



- ❑ Red Hat® Linux AS 2.1 Enterprise
  - ❑ SuSE® SLES 8
- LDAP support for the following:
  - ❑ Novell eDirectory for NetWare, Windows 2000, and Red Hat or SLES 8 Linux servers
  - ❑ Microsoft Active Directory for Windows 2000 servers
- Large-scale deployment support using multiple iFolder servers acting as a single system
- Report generator for administrators to view statistics on iFolder users and the iFolder system
- Automatic upgrade through the Red Carpet™ daemon in NNLS
- Client support for the following workstation operating systems:
  - ❑ Windows 98/ME
  - ❑ Windows NT® 4/2000 Professional
  - ❑ Windows XP Home and Professional
- Concurrent access to multiple iFolder accounts using Novell NetDrive to map drives to the iFolder server
- Thin-client support through Novell NetDrive for Citrix® Metaframe® servers, Windows 2000 Terminal Server, and ZENworks® OnDemand Services
- File encryption across the wire and on the iFolder server to protect user data from unauthorized access
- Management of iFolder server and accounts through a Web browser



---

For information about key features of the iFolder client, see the Novell iFolder 2.1 User Guide at <http://www.novell.com/documentation>.

---

### *iFolder Components*

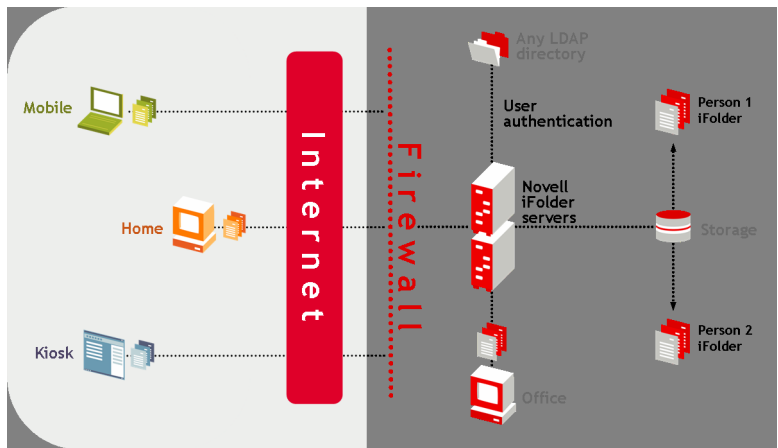
There are 3 software components to iFolder:

- iFolder server software
- iFolder client software
- Java® applet

These components work together to provide users with instant access to any iFolder files stored on their local computer from anywhere in the world.

The following illustrates how the iFolder server is accessed from different computers or locations:

**Figure 6-1**



At the center of the iFolder architecture is the iFolder server and storage components. These key components let you access and synchronize network files on the iFolder server from inside the firewall (from your office computer) or from outside the firewall (from a laptop, home computer, or kiosk).

Currently, the iFolder Java Applet is only compatible with Internet Explorer.

All users connect to the iFolder server through a small iFolder client to synchronize and store their data. Users can install the client on any Windows workstation. This sets up an iFolder directory on their local drive.

When users save or update any files to this local directory, the files are automatically delivered to the Novell iFolder server, and then synchronize to their other computers that have the iFolder client installed.

Using the iFolder Java Applet on Internet Explorer, users can also access their files by visiting the company's iFolder web site, and entering their ID, password, and pass phrase (the pass phrase enables the encryption of the files).

You can allocate space to each user by using a default policy, or by modifying a user's individual account.

Files stored on the iFolder server are encrypted and protected by the company's backup and storage procedures.

Users authenticate to the iFolder server through LDAP v3. The LDAP authentication server can be the Linux server that the iFolder product was installed on, or any other LDAP-enabled directory (such as eDirectory) that supports LDAP v3.

To authenticate, users must know their username and password and the pass phrase used for encryption. This information is verified by the iFolder server against the LDAP server.

LDAP authentication can be done using SSL on port 636 or clear text on port 389. It is important to realize that the LDAP server is not accessed by the iFolder client directly, but by an LDAP call from the iFolder server.

iFolder is both an intranet and an Internet solution that will work with any LAN or Internet connection.

If you are placing the iFolder server behind a firewall, you need to remember that iFolder uses both 80 and 443 for both client and server access. The administration page and the iFolder client authentication will be over 443.

### ***iFolder Architecture***

To understand how the iFolder components and architecture work to synchronize and provide access to personal files, you need to know the following:

- Web Servers and iFolder
- LDAP and iFolder
- Authentication and Synchronization
- How iFolder Synchronizes Files

### **Web Servers and iFolder**

The iFolder server software uses Apache as its default Web server for NetWare and Linux server operating systems. On Windows 2000, iFolder uses the IIS Web server.

When iFolder is active on NetWare servers with Apache-based solutions, it can run in the operating system space or in protected memory space.

Because iFolder requires some configuration changes to Apache-specific files, we recommend that you install iFolder on a server that does not have other applications that rely on Apache.

If you do have other applications that use Apache, these applications might not work when you install iFolder.

## LDAP and iFolder

iFolder uses LDAP for user authentication. It uses a Novell eDirectory or Microsoft Active Directory (for Windows 2000) as a central location for all of its LDAP objects that are specific to iFolder.

You can have iFolder and LDAP running on the same server or on different servers.

iFolder uses the following LDAP directories:

- **Global Settings LDAP directory.** This directory stores information about the iFolder system configuration and has iFolder Settings, iFolder Server, and LDAP Server objects.
- **User LDAP directory.** This directory is used for authentication and adds the iFolder Server Name and the Disk Quota attribute to user objects that have been authorized in the iFolder Management console to use iFolder.

Regardless of how many iFolder servers you have, you will have only one Global Setting LDAP.

However, you can have up to eight User LDAP directories. Multiple LDAP directories benefit companies whose user objects are already divided into different LDAP directories.

For example, if you have an LDAP directory for all of your vendors, another for your full-time employees, and another for your temporary hires, you can set up three User LDAP directories in iFolder to handle the iFolder accounts for each directory.

When deciding whether to use LDAP over SSL (port 636) or a clear text (port 389) connection, consider the following:

- Choose port 389 if you want to use LDAP without SSL encryption or if your LDAP server does not support SSL.

Port 389 is also a good choice if iFolder and LDAP are running on the same server. No communication of data is being transferred across the wire, so no encryption is necessary.

- Choose port 636 if you want to use SSL, which provides your network with encryption and security when data is transferred across the wire.

If you choose port 636, there will be some post-configuration required after the NetWare 6 installation.



---

If you want LDAP over SSL and your LDAP server is different from your iFolder server, you will need to export the LDAP server's trusted root certificate and then copy it to your iFolder server.

---

### Authentication and Synchronization

When you log in to iFolder, the iFolder client authenticates to the iFolder server by sending the encrypted username and password through an Internet connection to the iFolder server.



---

These credentials are encrypted using RSA and sent to the server in an HTTP packet. When the server authenticates the users, all subsequent communication between them is encrypted using the 128-bit Blowfish algorithm. However, all communication continues to happen over the standard http port 80.

---

The iFolder server uses this information to verify that the user exists, and then checks to see if the user object has been enabled in the iFolder Management console to use iFolder.

After the user object has been enabled, a user account must be created on the iFolder server before the user can begin using iFolder on his local workstation. An account is created the first time a user logs in to the iFolder server with the iFolder client.

After the user account is created, the account can then be managed with the iFolder Management console.

After the first login, a user can begin to add files to his iFolder directory and automatic synchronization begins. At first login, the user's account is created on the iFolder server and the iFolder home directory is placed on the user's desktop.

The iFolder client is always aware of any local activity and, based on the synchronization preferences chosen by you (as network administrator) or the user, the iFolder client regularly asks the iFolder server for a download of any new data.

After the iFolder server downloads the data, it uploads any updates from the iFolder local directory. When you access your account from a different computer, the iFolder server first downloads any updates before uploading the iFolder client changes.



---

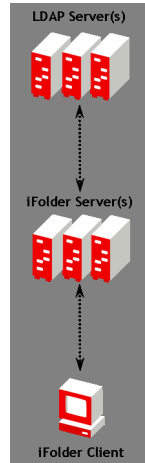
For additional details on iFolder components and architecture, see “In-Depth Look at Authentication, Encryption, and Synchronization” in the Novell iFolder Installation and Administration Guide at <http://www.novell.com/documentation/lg/ifolder21>.

---

## How iFolder Synchronizes Files

The following steps outline the synchronization process between the files on your local hard drive and the iFolder server:

**Figure 6-2**



1. The user authenticates to the iFolder server through the iFolder client.
2. The iFolder server performs an LDAP bind and verifies that the user is on the correct server. If not, the server redirects the user to the correct server.
3. The iFolder client performs a reconciliation operation and checks the files on the user's workstation with the files on the server.
4. iFolder downloads any new files from the server, and then uploads any new files in the local iFolder folder.

During this process, iFolder only synchronizes the changed portion of an existing file on a 4 kb block level.

5. The iFolder server receives the new files and increases the sync index. The sync index indicates the current state of the file system.



A match between the sync index on the iFolder server and the sync index on the client workstation indicates that there has been no change. This is how the iFolder client knows if it is out of sync.

The sync index is only 4 bytes and is a very low cost server operation.

6. When another iFolder client workstation connects to the iFolder server, the server compares the sync index and downloads any new files.
7. If there is a new file, iFolder monitors the file system and catches the event.
8. iFolder then uploads the file to the server, and the iFolder server increments the sync index.
9. If there is a conflict, iFolder uses time stamps for resolution, and the old file is placed in the Conflict Bin.

## **Objective 2      Install and Configure iFolder**

You install and configure iFolder on Linux in four basic stages:

1. Install the first iFolder server.
2. Configure global settings, default policies, LDAP authentication sources, and iFolder servers.
3. Provision iFolder users.
4. Install additional iFolder servers (as needed).

To complete these phases and manage iFolder, you need to know the following:

- Prerequisites for Installing on Linux Servers
- How to Install iFolder from NNLS
- How to Configure Your iFolder Server

- How to Access the iFolder Web Sites
- How to Install and Configure the iFolder Client
- How to Manage iFolder User Accounts
- How to Manage iFolder Servers
- How to Manage LDAP Servers
- How to Monitor Your iFolder System
- How to Generate Reports

### ***Prerequisites for Installing on Linux Servers***

Before you install Novell iFolder 2.1 with NNLS, make sure your Linux server and enterprise network environment meet all of the following prerequisites:

- **iFolder server requirements.** Configure an enterprise server with the following components:
  - Minimum 450 MHz Intel® Pentium® II processor.
  - Minimum 512 MB RAM. Add more RAM if the server supports programs or services other than iFolder.
  - Storage capacity for server software (about 15 MB) plus the user data for all the users' iFolder accounts.

As a guide, consider the expected number of users and the quota of storage allotted for each iFolder user account. Also, consider the likely growth associated with each of the parameters to anticipate future demand for storage.
  - An active network or Internet connection with full two-way access to other computers on the network or Internet, or both, depending on your deployment.
- **iFolder server Linux requirements.** Install and configure Red Hat Enterprise Linux AS/ES 2.1 or SLES 8, including all service packs and patches on your iFolder server.

- **Storage configuration.** Create a storage volume accessible from the Linux server where you want to store the user data for the iFolder accounts.

Best practice is to not store iFolder data, which can grow very rapidly, on a volume that the operating system needs to have free space on to function normally.

Storage solutions can include any volume options supported by Red Hat or SLES 8, including directly attached storage and storage area networks.

Your LDAP server and iFolder server can reside on the same machine.

- **DNS configuration.** Make sure the DNS name and IP address of the enterprise server you want to use as your iFolder server are listed on the DNS server.
- **iFolder client platform.** Make sure that Internet Explorer (IE) 5.0 or later is installed on Windows workstations that will use the iFolder client.
- **iFolder Java Applet.** If users are going to access their files through a web browser, make sure they have Internet Explorer because the Java applet is only compatible with Internet Explorer.
- **Firewall configuration.** You can place your iFolder server inside the firewall (no external access), outside the firewall (ISP model), or both (oneNet model).

iFolder requires HTTP port 80 (for file access), HTTPS port 443 (for iFolder management), and LDAP port 389 or 636 (for authentication).



---

Access through the firewall can be firewall pin holes, ICS/iChain®, or Level 4 (L4) switches.

---

It is important to note that the iFolder client does not access the LDAP server. The iFolder server is the only piece of iFolder using the LDAP server for authentication.

This means that if the iFolder server and the LDAP server being used for authentication are on the same side of the firewall, you do not need to open additional ports.

### ***How to Install iFolder from NNLS***

To install iFolder 2.1 on your Linux server, you need to know the following:

- Steps for Installing iFolder
- iFolder Objects in the eDirectory Schema
- iFolder File Placement

### **Steps for Installing iFolder**

The general steps for installing iFolder are

1. Meet iFolder Dependencies
2. Gather Required Information
3. Use the NNLS Install Feature

### **Meet iFolder Dependencies**

iFolder is dependent on the following NNLS components:

- Apache 2.0.45 on the same server
- eDirectory 8.7.1 or later anywhere within the network

If these components are not already installed, you do not have to install them before installing iFolder.

The NNLS install program will select the required components, along with their dependencies, when you select the iFolder component. They will all be installed in the same process.

See Table 2-5 for information needed to successfully install any iFolder dependencies that are not already installed.

### Gather Required Information

The following table describes the information needed to successfully install iFolder:

**Table 6-1**

Configuration Data Required	Description
LDAP server IP Address or DNS Hostname	The IP address of the LDAP server for iFolder.  This is where iFolder objects and global settings will be created and configured.
LDAP Port	The LDAP port through which users will authenticate to the eDirectory server (above) for access to the designated iFolder server (below).  The default value is 636.
LDAP Admin Name with Context	The fully distinguished name of the Admin for the LDAP server specified for iFolder.  The name and context must be specified using typeful syntax ( <i>cn=name.ou=organizational-unit.o=organization</i> ).  This is the context where the iFolder objects are placed and is the context used for contextless login.
Admin Password	The password for the LDAP server Admin.

**Table 6-1** *(continued)*

<b>Configuration Data Required</b>	<b>Description</b>
iFolder Server IP Address	The IP address or DNS name of the server on which you are installing iFolder.  iFolder user directories and files are stored on the NNLS server.
iFolder admin user names	Additional users in the same context as the designated iFolder Admin who should also have management access to iFolder.  Separate the user names using semi-colons (;).
iFolder user data path	The location on the NNLS server where iFolder user data file is stored.  The default is /var/opt/novell/ifolderdata.

**Use the NNLS Install Feature**

To install iFolder from NNLS, do the following:

1. Perform the steps to do a custom installation.



If necessary, see Section 2 for details on how to perform a custom installation.

2. Deselect the services you *do not want* to install, select the iFolder service, and then continue.

If eDirectory has not previously been installed, notice that it is selected by default when you select iFolder (along with other required components such as Apache and Tomcat).

If eDirectory has been previously installed, the install program will indicate which components are already installed.

3. Accept the license agreement.

4. (Conditional) If prompted for the location of the NICI Foundation Key (NFK) file, insert the license diskette and enter the path to the NFK file.

You will only be asked for the NICI Foundation Key if eDirectory has not previously been installed.

5. Enter the information requested at each prompt (see Table 6-1).
6. View the summary information and make any necessary corrections.
7. When all the information is correct, finish the installation.
8. View the readme file and save the installation settings log file.

### **iFolder Objects in the eDirectory Schema**

The iFolder installation extends your eDirectory LDAP schema to include the following objects:

- iFolder Server Agent (iFolder\_ServerAgent)
- iFolder Settings object (iFolder\_Settings)
- iFolder User LDAP object (iFolder\_ldap01) CN
- iFolder Server object (iFolder\_server01)

The schema extension and the newly created objects enable your iFolder server to run with the LDAP settings you specified during the installation. These settings are used as your Global Settings LDAP configuration.

The iFolder Settings object is created only once and it holds all the Global Settings LDAP configuration for the iFolder service on your network.

iFolder User LDAP objects and iFolder Server objects represent each LDAP server and iFolder server, respectively, that you have in your network.

So, for every additional LDAP server and iFolder server that you add through the iFolder Management console, a new iFolder User LDAP object (iFolder\_ldap02, iFolder\_ldap03, etc.) and iFolder Server object (iFolder\_server02, iFolder\_server03, etc.) are created.



---

All iFolder management must be done through the iFolder Management console.

---

### **iFolder File Placement**

When you install iFolder from NNLS, files are placed in the following folders:

- /opt/novell/ifolder (iFolder files)
- /opt/novell/httpd/bin/httpd (Apache configuration files)
- /opt/novell/ifolder/bin/ (iFolder Apache server modules)
- /opt/novell/ifolder/DocumentRoot (HTML files)
- /var/opt/novell/ifolderdata/ACCOUNTS (User data synchronized to iFolder server)



**10 minutes****Exercise 6-1 Confirm the iFolder 2.1 Installation on Your NNLS Server**

In this exercise, you confirm that iFolder is installed on your NNLS server. (iFolder was installed in Exercise 2-1.)

Do the following:

1. Check your DAX-TREE to make sure that the iFolder objects have been created:
  - a. From your NNLS server desktop, launch **Mozilla**; then start iManager by entering the following:  
**`https://DAX.your_container.DigitalAirlines.com/nps/iManager`**
  - b. Log in as **admin** with a password of **novell**.
  - c. At the left under **eDirectory Administration**, select **Modify Object**; then select the **Object Selector** icon (magnifying glass) on the right.
  - d. Select **Browse**.
  - e. Browse to and view the contents of **your container**.  
You might need to select **Next** to view the iFolder objects.  
You should see the following:
    - ❑ iFolder\_ServerAgent (this has a user icon)
    - ❑ iFolder\_Settings
    - ❑ iFolder\_ldap01
    - ❑ iFolder\_server01
  - f. Select **iFolder\_Settings**; then select **OK**.  
Note the valued attributes and the unvalued attributes that can be added to the Valued Attributes list.
  - g. Select **Cancel**.

If students inadvertently accessed this object through the iFolder Server Management link, they will not be able to open this object.

2. Check the user data folder:
  - a. Open a terminal session and log in as root (**su -**) with a password of **novell**.
  - b. From the shell prompt, enter the following:  
**cd /var/opt/novell/ifolderdata**
  - c. List the files and folders in the directory by entering **ls -al**.  
Notice that there are 2 log files (ACCESS.LOG and ERROR.LOG) and an ACCOUNTS folder.  
The ACCOUNTS folder will hold the data synchronized by users from the iFolder client.
  - d. Check the contents of the ACCOUNTS folder by entering **cd ACCOUNTS** (uppercase); then enter **ls -al**.  
No accounts currently exist, but will be added later as users synchronize data to your NNLS iFolder server.
  - e. Close the root session by entering **exit**.
  - f. Close the terminal session.

*(End of Exercise)*

### ***How to Configure Your iFolder Server***

After iFolder is installed, you must perform some post-installation configuration tasks to make iFolder work according to your enterprise's needs. These tasks are described in this section.

Also described in this section are the steps to changing your iFolder data location, which is an optional task.

- Post-Installation Configuration Tasks
- Changing the iFolder Data Directory

## Post-Installation Configuration Tasks

After installing iFolder, you need to configure your iFolder server using the iFolder Management console (available from iManager).

The following tasks need to be completed:

- User context must be defined in the iFolder Management console.
- User objects must be enabled in the iFolder Management console.
- Users must log in to the iFolder server with the iFolder client to create their iFolder accounts on the iFolder server and to create their local iFolder home directories.



The following steps show you how to configure your first iFolder server if LDAP and the iFolder server are running on the same computer.

For information on configuring additional iFolder servers, or configuring iFolder when LDAP is running on a different computer, see the “Novell iFolder Installation and Administration Guide” available at <http://www.novell.com/documentation>.

---

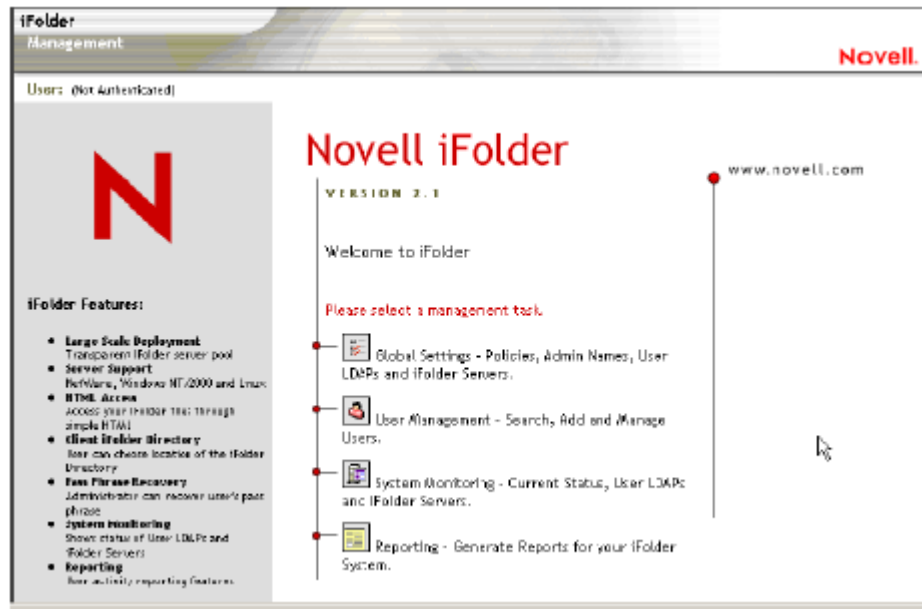
Do the following:

1. Display the iFolder Management console in a web browser by doing one of the following:
  - Enter the following in a web browser:  
**`https://IP_or_domain/iFolderServer/Admin`**  
where ***IP\_or\_domain*** is the IP address or DNS domain name of your iFolder server.  
  
If you specified different ports during the installation, append the IP address of the server with a colon followed by the port number (such as  
**`https://192.168.1.1:81/iFolderServer/Admin`**).

- From iManager under **iFolder Management**, select **Launch iFolder Management**, enter the iFolderServer name, and then select **OK**.

The following page appears if you directly access iFolder Management (outside of iManager):

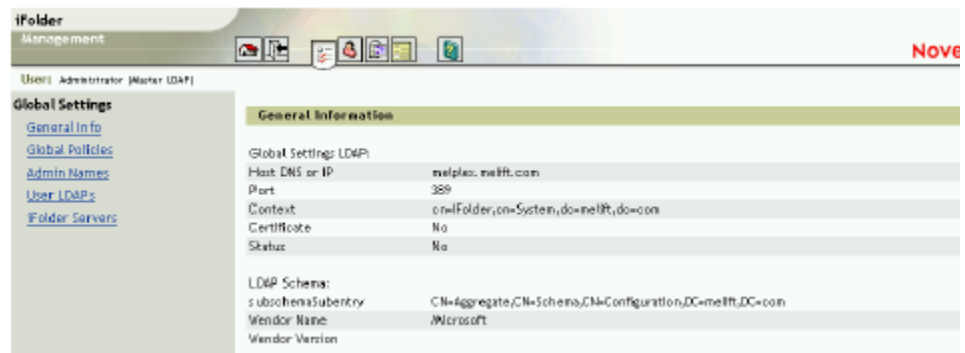
Figure 6-3



2. Select **Global Settings**; then log in with your iFolder administrator *username* and *password*.

The following General Information page appears (it also appears if you access iFolder Management from iManager):

Figure 6-4



Successful logging in also means that the server installation is complete for your first server.

### 3. Define your user context:

During the iFolder installation, you specified the context of your Admin objects. For authentication purposes, you must now define the context where your users reside.

When you define your user context, all the user objects that reside in the specified context will appear in the iFolder Management console.



If you need to add a User object to your context, use the User Management section of the iFolder Management console.

- a. At the left under **Global Settings**, select **User LDAPS**.
- b. Select the *server* you want to manage.

The following appears:

Figure 6-5



- c. From the Contexts to Search, select the **context** where your users are located.  
iFolder will search the contexts you specify when authenticating users.
- d. (Conditional) If you want LDAP to search subcontexts below the specified context during user authentication, select **Search Subcontexts**.



---

If you are doing a subcontainer search, you must assign the CN property to the eDirectory [Public] trustee or create an LDAP proxy user. Any rights assigned to the [Public] trustee are automatically inherited by all other objects in the eDirectory tree.

You might not want to assign the CN property to the [Public] object if these rights will cause a security risk.

If your iFolder server is outside the firewall and you do not want the CN property assigned to all objects in your NDS tree, you can also use an LDAP proxy username to search the subcontainers of your tree.

---

- e. (Conditional) If you want to add additional contexts to search, select **Add**.
- f. Save these default user authentication settings by selecting **Update**.

Multiple users with the same CN in different contexts prevent the user from successfully authenticating to the iFolder Server. Only users with a unique CN (Common Name) are able to authenticate.

**4. Enable users to access iFolder:**

Before users can use iFolder on their local workstations, you must first enable their user objects in the iFolder Management console.

Users can have only one account associated with a given user ID. However, users can have multiple accounts under different user IDs.

After a User object is enabled, instruct the user to log in to the iFolder server to create an iFolder account.

The iFolder account is created the first time a user logs in to the iFolder server via the iFolder client, the Java applet on the iFolder Web site Login, or NetDrive.

- a. From the iFolder Management console, select **Advanced Search**; then select the criteria you want to use to find all the users on the server that you just installed iFolder on.

Make sure you specify the appropriate User LDAP context. You can use search criteria such as name, first name, last name, email address, user type, iFolder server, and user LDAP context.

- b. Start the search by selecting **Search**.

A list of users matching the search criteria appears:

Figure 6-6

The screenshot shows the iFolder Management console with the 'Advanced Search for Users' window open. The 'Search Criteria' section includes a 'Name' dropdown, a 'Starts With' dropdown, and a 'Search' button. Below these are radio buttons for 'All Users' (selected), 'iFolder Users', and 'Non-iFolder Users'. There are also dropdowns for 'iFolder Server' (set to 'All') and 'In User LDAP Context' (set to 'All'). The 'User Management' section has buttons for 'Enable' and 'Disable' for 'checked users as iFolder users' and 'all found users as iFolder users', along with a dropdown for 'on iFolder Server' set to 'Default'. At the bottom, a list of users is displayed with checkboxes and user names: administrator, krbtgt, tsinternetuser, guest, oliveoil, and winnpy.



- c. Select all users that you want to have iFolder account; then do one of the following:

- ❑ Select the **Enable** button next to Checked Users as iFolder Users.

*or*

- ❑ Select the **Enable** button next to All Listed Users as iFolder Users.

If your first iFolder server is also running LDAP, you are finished with the iFolder configuration. After users have logged in to create their iFolder accounts, you can start managing their accounts.

### ***How to Access the iFolder Web Sites***

After you install and configure iFolder on your server, your users can download and install the iFolder client and then log in to the iFolder server.

The first time the users log in with the iFolder client, they activate their iFolder accounts, providing that their accounts have already been enabled in the iFolder Management console.

After iFolder has been installed on your server, you have access to the following Web sites:

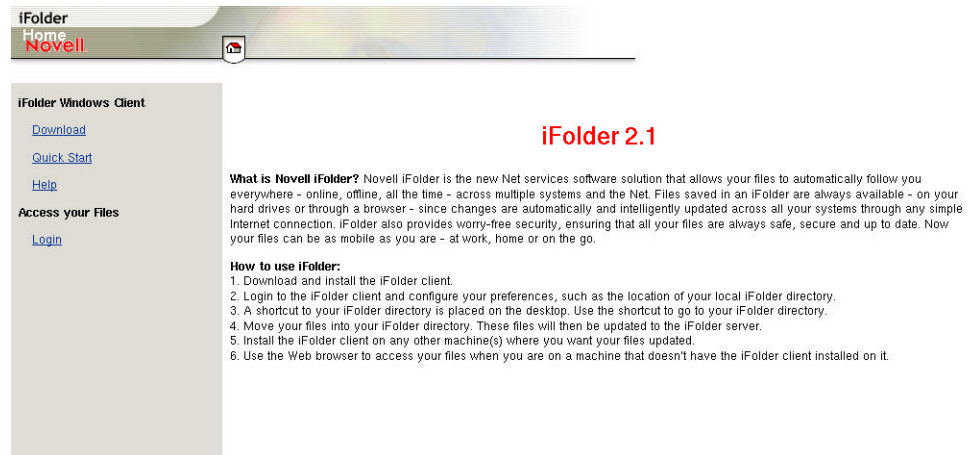
- **iFolder Web site.** To access the default iFolder Web site, enter the following URL into your Web browser:

**`https://IP_or_domain/iFolder`**

where IP\_or\_domain is the IP address or domain name of your iFolder server.

The following appears:

Figure 6-7



This site contains the Novell iFolder 2.1 User Guide, iFolder 2.1 Quick Start, and other important information about Novell iFolder.

This site is where users download the iFolder client. They can also use the Login link to access their iFolder files via a browser (using the Java applet) if they are using a computer that does not have the iFolder client installed.



Users must establish their iFolder account via the iFolder client before they can access the account using the Java applet.



The iFolder Java applet only works with Internet Explorer and is not supported in any other browser.

To access your files in iFolder from a Linux workstation, use NetStorage, which is covered in a later section.

To go directly to the web browser login page, enter

**`https://IP_or_domain/iFolder/Myfiles`**

You can modify this page to fit your company's internal needs.

- **iFolder Management console.** This lets you manage your users' iFolder accounts as well as your iFolder and LDAP servers.

To access the iFolder Management console, open a browser and enter the following:

**`https://IP_or_domain/iFolderServer/Admin`**

where ***IP\_or\_domain*** is the IP address or DNS domain name of your iFolder server.

If you specified different ports during the installation, append the IP address of the server with a colon, followed by the port number. For example:

**`https://192.168.1.1:81/iFolderServer/Admin`**

### Changing the iFolder Data Directory

If, after you have installed iFolder, you need to change the location of the iFolder data directory, do the following:

1. Create an ifolderdata folder in the new location. For example, if you want to change the location to /home/ifolderdata, enter the following command:  
**`mkdir /home/ifolderdata`**
2. Copy the content of /var/opt/novell/ifolderdata to the new location.
3. Modify the /etc/opt/novell/ifolder/httpd\_ifolder\_unix.conf file by changing the iFolderServerRoot parameter to indicate the new directory location.

For example: **`iFolderServerRoot "/home/ifolderdata"`**

4. Apply the necessary ownerships and permissions to the new parent directory. The assigned owner should be novlwww and the assigned group should be novlwww. The permissions should be 700.

For example, enter the following commands:

**ls -l /home/ifolderdata** (to see the current ownership and permission settings)

**chown novlwww:novlwww /home/ifolderdata**

**chmod 700 /home/ifolderdata**

**ls -l /home/ifolderdata** (to see the changes made to the ownership and permission settings)

5. Restart novell-httpd, by entering **/etc/init.d/novell-httpd restart**.

### ***How to Install and Configure the iFolder Client***

You install the Novell iFolder Client software on each desktop or laptop that you typically use. The iFolder client is designed for workstations in the following Microsoft® operating environments:

- Windows 98/ME
- Windows XP Home and Professional
- Windows 2000 Professional

You need the iFolder client on your workstation to take advantage of the automatic synchronization feature of iFolder. However, you can access your files on the iFolder server from any computer using a web browser and an active Internet connection.

Before you install the client, be sure your workstation meets the following prerequisites:

- Internet Explorer (IE) 5.0 or later installed
- Internet connection activated

To install and configure the iFolder client on your workstation, do the following:

1. From a web browser, go to your iFolder web site by entering the following:

**`https://IP_or_domain/iFolder`**

where IP\_or\_domain is the IP address or domain name of your iFolder server.

The iFolder home page appears.

2. At the right under iFolder Windows Client, select **Download**; then select **Save**.
3. Save the iFolder client install file to your desktop.  
A Download complete dialog appears.
4. Start the installation by selecting **Open**.
5. At the Novell iFolder Setup welcome window, select **Next**.
6. Select your language; then select **Next**.  
The License Agreement appears in a browser window.
7. Close the browser window; then accept the license agreement by selecting **Yes**.
8. Install the iFolder client in the default folder (C:\Program Files\Novell\iFolder) by selecting **Next**.
9. Select **Finish**.  
A readme file appears in a browser window.
10. Review the readme file; then close the window.

**11. Do one of the following:**

- ❑ If you are running Windows XP/2000, select **Yes, I want to restart my computer now**; then select **Finish**.

Wait for your workstation to restart.

- ❑ If you are running Windows 98/ME, select **Start iFolder**.

A Welcome to Novell iFolder message appears with instructions for using the iFolder client.

**12. Select *Continue*.**

The Novell iFolder Login window for the iFolder client appears.

**13. Enter the User ID and password of an eDirectory user enabled to use iFolder on the displayed iFolder server; then select *Login*.**

A Novell iFolder Location window dialog appears. In this dialog you enter the folder on your workstation where you want to store files for synchronizing to the iFolder server.

The default location for Windows XP is c:\documents and settings\username\my documents\ifolder\userid\home. For Windows 98/ME, the default location is c:\my documents\ifolder\userid\home.

The username is your workstation username (such as Administrator); the userid is your iFolder user ID (typically the same as your network user ID).

**14. Do one of the following:**

- ❑ Select the default location by selecting **OK**.
- ❑ Browse to and select another folder on your hard drive; then select **OK**.

An Internet Folder Setup dialog appears.

**15.** Do one or both of the following:

- ❑ If you want to encrypt your files for transmission and for storage on the iFolder server, select **Encrypt files**.
- ❑ If you want the iFolder client to come up each time you start Windows, select **Enable automatic login at startup**.

**16.** When you finish, select **OK**.

If you select Encrypt files, a Get Pass Phrase dialog appears.

iFolder uses the pass phrase to create the encryption keys that are used when files are uploaded or downloaded between your computer and the iFolder server.

Encrypting your data as it travels across the wire to the iFolder server prevents your files from being accessed by someone other than you.

Although your files are not stored as encrypted files on your computer, they are stored in encrypted form on the iFolder server.

After setting a pass phrase, you use it each time you log in with the iFolder client (from any workstation).

You can also select Remember pass phrase to avoid having to enter it on your own workstation each time you log in with the iFolder client.

**17.** Enter and re-enter the *pass phrase*; then enter a **hint**.

**18.** (Optional) Select **Remember pass phrase**.

**19.** Continue by selecting **OK**.

A Pass Phrase Recovery dialog appears.

The Enable pass phrase recovery option in this dialog enables recovery of your pass phrase by your iFolder administrator (in the event that you forget it).

The hint in the previous dialog can be used to help you remember your pass phrase.

20. Select (or deselect) **Enable pass phrase recovery**; then select **OK**.

You are logged in to iFolder.

Notice the iFolder client icon in the system tray.

21. Right-click the icon; then select **Account Information**.

A dialog appears with tabs that let you view and set information such as the following:

- ❑ **iFolder.** The folder on your workstation where you keep your iFolder files.
- ❑ **Server Information.** The space still available to you for storing files on the iFolder server.
- ❑ **View Activity.** An active log that displays synchronization activity for your iFolder account.
- ❑ **Preferences.** Allows you to set synchronization and password/pass phrase parameters.

22. View and set the information you want and select **Apply**; then close the window.

23. Log out of the iFolder client by right-clicking the iFolder icon; then select **Logout**.

24. Log in to the iFolder client by right-clicking the iFolder icon; then select **Login**.



---

For details on using the iFolder client to synchronize and configure iFolder, see the “Novell iFolder User Guide” at [www.novell.com/documentation](http://www.novell.com/documentation).

---



## ***How to Manage iFolder User Accounts***

As an iFolder administrator, you can perform tasks such as the following:

- Set Global Client Policies
- Set Security Pass Phrase
- Change Individual User Policies
- Recover Pass Phrases
- Change a User Pass Phrase
- Restore Deleted or Corrupted Files
- Delete User Data on the Server
- Use the Conflict Bin
- iFolder and NetDrive

### **Set Global Client Policies**

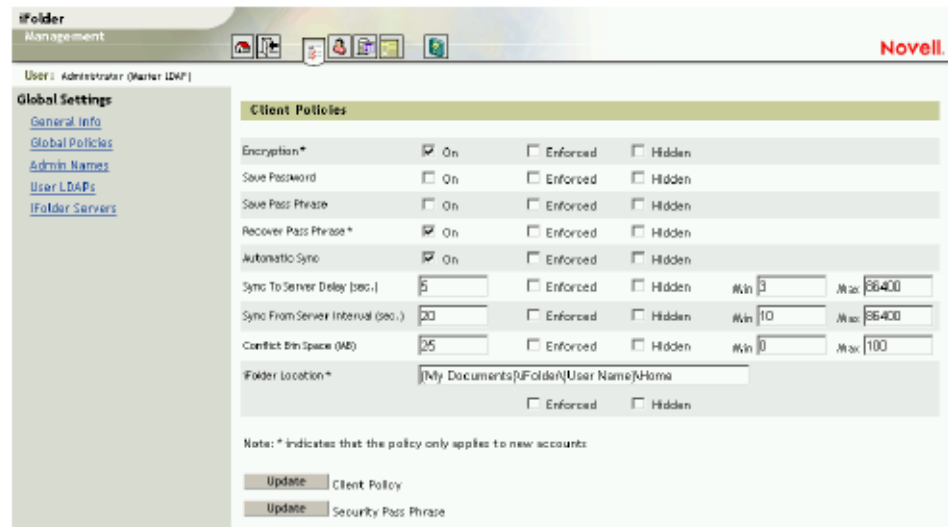
The iFolder administrator uses the Global Client Policies to control which features the user can configure for the iFolder client and what the default settings are.

To set Global Client Policies, do the following:

1. Display the iFolder Management console in a web browser.
2. Log in to the Global Settings section; then select **Global Settings**.

The following appears:

Figure 6-8



There are three levels you can set for the Global Client Policies:

- ❑ **Default Settings.** Set the default settings for the configurable features in the iFolder client.

Select the check box or fill in a value to enable that option by default in the iFolder client. The user can view the settings and can change them.

- ❑ **Enforced.** Select the check box to enforce the default setting you specified for a configurable feature in the iFolder client.

If enforced, the user can view the settings, but cannot change them. The features and settings are grayed out in the iFolder client interface.

- ❑ **Hidden.** Select the check box to hide the configurable feature and its default setting in the iFolder client.

The user will not see the option or the setting in the iFolder client. Hidden features are enforced by default.

You can set the following policies:

- ❑ **Encryption (+).** This allows the user's local data to be encrypted as it leaves a workstation to travel to the iFolder server, resides on the server, and travels to another workstation, where it is unencrypted; the user's data resides on the user's workstations in unencrypted form.
- ❑ **Save Password.** This allows automatic entry of the user's password during any iFolder login sequence.

The iFolder client does not pass on system warnings about grace logins.

If your organization requires frequent password changes, we recommend that users be notified of pending change requirements by alternate means so users can proactively change the stored password, if they select this option.

- ❑ **Save Pass Phrase.** This allows automatic entry of the user's encryption pass phrase during any iFolder login sequence.
- ❑ **Recover Pass Phrase (+).** This allows the iFolder administrator to recover the user's encryption pass phrase.

Because the Pass Phrase is the user's encryption key, the administrator is able to decrypt the user's data files on the iFolder server.

Allowing this option implies a trusted relationship for the iFolder administrator.

- ❑ **Automatic Sync (+).** This allows the iFolder client to automatically synchronize the user's iFolder files between the local iFolder directory and the iFolder server.

The following settings are available:

- ❑ **Sync to Server Delay (+).** If Automatic Sync is allowed, sets the default time (in seconds) that the iFolder client waits after a file in the local iFolder directory changes until it automatically uploads the file to the iFolder server. Also sets the minimum and maximum values allowed.
- ❑ **Sync from Server Interval (+).** If Automatic Sync is allowed, sets the default time (in seconds) after a synchronization occurs that the iFolder client waits to check with the iFolder server to determine if there are changed files it needs to automatically download to the local iFolder directory. Also sets the minimum and maximum values allowed.
- ❑ **Conflict Bin Space.** Sets the default size (in MB) of the Conflict Bin for the user's iFolder account. Also sets the minimum and maximum allowed values.
- ❑ **iFolder Location (+).** Sets the default path of the user's local iFolder directory.

Some options, distinguished above by a plus (+), apply only to new iFolder user accounts. They appear in the first instance of an iFolder client install for that user.

After the user sets these preferences, the items no longer appear in the login sequence or in subsequent installs of the iFolder client by that user.

Changing the marked option has no effect for existing users; it affects only subsequently created accounts. If you want to change marked features for all users after accounts exist, you must coordinate with users to delete their accounts and recreate them with the new settings enforced.

### 3. When you finish, select **Update Client Policy**.

Whenever you update the Global Client Policy settings, all of the settings apply only to new iFolder user accounts.

For current iFolder accounts, the settings apply only as they would for subsequent new installs of the iFolder client. The updated policies and settings do not replace the current iFolder users' settings during iFolder client upgrades.



---

To force the updated settings to apply for existing users, the users must uninstall the iFolder client, and then reinstall it.

However, the account-based settings will not change unless you delete the current user account and create a new account for that user.

---

### Set Security Pass Phrase

The iFolder administrator can update the iFolder Admin user's security pass phrase from the Global Client Policies screen. The security pass phrase is used to recover an iFolder user's pass phrase, if necessary.

Do the following:

1. In the iFolder Management console, select **Global Settings**.
2. (If prompted) Log in with your Admin username and password.
3. Select **Global Policies > Display Client Policies > Update Security Pass Phrase**.
4. Enter a *security pass phrase* and retype it; then select **Update**.

### Change Individual User Policies

By default, global client policies apply to all iFolder user accounts. However, the iFolder administrator can modify the policy settings for a specific user by doing the following:

1. In the iFolder Management console, select **User Management**.
2. Select *User\_ID* > **Edit**.

The following appears:

Figure 6-9

The screenshot shows the iFolder Management console. The top bar includes the iFolder logo, a 'Management' tab, and a Novell logo. Below the bar, the user 'Administrator (Master LDAP)' is selected. The left sidebar shows 'User Management' with links for 'Search', 'Advanced Search', and 'Add'. The main area is titled 'Policies for oliverell' and contains a table of policy settings:

Policy Name	On	Enforced	Hidden	Min	Max
Encryption*	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Save Password	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Save Pass Phrase	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Recover Pass Phrase*	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Automatic Sync	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Sync To Server Delay (sec.)	<input type="text" value="5"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="5"/>	<input type="text" value="36400"/>
Sync From Server Interval (sec.)	<input type="text" value="10"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="10"/>	<input type="text" value="36400"/>
Conflict Bin Space (MB)	<input type="text" value="25"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="0"/>	<input type="text" value="100"/>
Folder Location*	<input type="text" value="My Documents\Folder\%User Name%\Home"/>				
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

Note: \* indicates that the policy only applies to new accounts.

Buttons: Update Client Policy, Remove Client Policy

This page allows access to the user's account information.

3. Set the user-specific policy settings.

User-specific policy settings take precedence over the global policy settings.

4. When you finish, select **Update**.

### Recover Pass Phrases

To recover a user's pass phrase, either the policy must have been set to Enforced or the user must have enabled pass phrase recovery the first time he logged in with the iFolder client.

To recover a user's pass phrase, do the following:

1. In the iFolder Management console, select **User Management**.
2. Search for the appropriate user; then select *username*.
3. Scroll down to the bottom of the list; then select **Recover**.
4. Enter your security pass phrase; then select **OK**.
5. When the pass phrase appears, let the user know what it is.

### Change a User Pass Phrase

When users install the iFolder client the first time, they are asked to authenticate to the iFolder server. They are then asked if they would like to encrypt their data.

If they choose to encrypt their data, iFolder then prompts for a pass phrase. This pass phrase becomes a part of the key that is used to encrypt the data when it is transmitted to the iFolder server.

If a user wants to change a pass phrase because he or she has forgotten the pass phrase, you can recover the pass phrase using the iFolder Management console.

However, if the user wants to change to a new pass phrase (for security reasons) and the user does not have the data locally, make sure the user understands that the only way to change the pass phrase is to delete the data from the iFolder server and have the iFolder client encrypt the data and send it up to the server again.



---

If the user does not have the data stored locally, have the user synchronize the data to the local hard drive; then proceed with the process to change the pass phrase.

---

Do the following:

1. In the iFolder Management console, find and select the user account to display the user's information.
2. Look at the Number of Connections line.  

If this line does not show "0," you must have the user log out of his or her iFolder client.
3. Look at the Disk Quota setting and the Used Space value.  

If either of these values is above 100 MB, you will need to adjust the Disk Quota value later (step 8).
4. Confirm that the user has a sufficiently fast connection to facilitate the upload of the data after you remove the account.  

You probably don't want to do this over a dial-up connection.
5. Confirm that the user has his data on his local disk.  

This is very important because you are about to delete the data from the server.
6. Select the **Remove User** button; then confirm deletion by selecting **Yes**.  

The user account has now been removed from the server. All of the user's data has also been deleted from the server.
7. Have the user right-click on the iFolder client icon (in the system tray) and select **Login**.  

The user will be prompted to choose encryption again and asked for a new pass phrase.

After the user has chosen a new pass phrase, the iFolder client logs the user in and creates a new account with the default Disk Quota space.
8. Go to the user's account and adjust the Disk Quota with the value from step 3.  

The user's data should begin to sync back up to the server.





The user might receive an error message saying that there isn't enough disk space to synchronize data. Have the user select OK. The error will no longer appear after you adjust the Disk Quota value.

### Restore Deleted or Corrupted Files

If a user needs to recover data from a deleted or corrupted file, you can restore the user's folder to a secondary iFolder server. From there, the user can access the iFolder server's copy of his local files via a browser or NetDrive.

Do the following:

1. Log in to the **User Management** section of the iFolder Management console.
2. Search for the user; then click the *username* to locate the iFolder Account Path.

The following is an example of the account path in an iFolder user account:

Figure 6-10

iFolder User: etuft	
Distinguished Name	cn=etuft,o=novell
User LDAP	iFolder_idap01 (137.65.71.9)
iFolder Server Name	iFolder_server01 (137.65.71.9)
iFolder Account Path	2C12E973EF7144E74009D0C62EEF42200C
Disk Quota	200 MB <input type="button" value="Update"/>
<input type="button" value="Disable"/> iFolder User	

3. Restore the folder located at the iFolder Account Path from a backup tape to a secondary iFolder server that the user can attach to.
4. Have the iFolder user use the Java applet or NetDrive to access the secondary iFolder server.

When the user logs in, the Java applet will show the user's data and he can download the file that was previously deleted.

The Java applet and NetDrive are good choices because they don't sync data, they only give access.

### **Delete User Data on the Server**

If a user cannot remember his password, you can delete the user data on the iFolder server and then have the user log in again. When he logs in, he will be prompted to enter a new password.

Do the following:

1. Before you delete the user account, the user must do the following to prevent data loss during an account reset:
  - a. Copy data from the current local iFolder directory to another local directory on the user workstation, and then delete the local iFolder directory.
  - b. Uninstall the iFolder client from the user workstation by doing the following:
    - a. Select **Start > Settings > Control Panel > Add/Remove Programs > Change or Remove Programs**.
    - b. Select **Novell iFolder client**; then select **Change/Remove > Yes**.
  - c. Go to the iFolder Web site to download the iFolder client software.
  - d. Follow the download and installation instructions to install the iFolder client.
  - e. If the User ID, Password, or Encryption Pass phrase have changed, enter the new values during the reinstallation of the iFolder client.
  - f. Move the user data to the newly created local iFolder directory.

g. Do one of the following:

- Wait for the files to synchronize automatically.
- Right-click the iFolder icon in the system tray; then select **Sync Now**.

Once the user completes these steps, you can delete the user account.

2. In the iFolder Management console, select **User Management**.
3. Log in with your Admin *username* and *password*.
4. Search for a specific user if you know the unique user ID; if not, find the user by doing an advanced search.
5. Select the *username*, scroll to the bottom of the page, and select **Remove iFolder User Data**.
6. Confirm the removal of the user data by selecting **OK**.

### Use the Conflict Bin

The iFolder client has a feature called the Conflict Bin. A user will rarely need to access this option; however, understanding this feature is useful. The following scenario illustrates what the Conflict Bin is and how it works.

Suppose that John is one of your iFolder users. John has the iFolder client installed on two computers: computer A and computer B. At some point in the day, John disconnects both of these computers from the network and continues to work from both computers offline.

While he is working, he makes a change to one of his iFolder files on computer A and then, later in the day, he makes a different change to the same file on computer B.

He then reconnects computer A to the network in order to synchronize the changes to the iFolder server. Then, John reconnects computer B to the network to synchronize the new change.

When computer B reconnects to the network and synchronizes the change to the iFolder server, the change that John made on computer A would be overwritten with the change that John made to that same file from computer B.

To prevent data loss, iFolder saves the overwritten file to the Conflict Bin. John can access the Conflict Bin by right-clicking the iFolder icon located in the system tray of the computer that originally contained the file that was overwritten.



---

If the problem file is larger than the quota set for the Conflict Bin, the file will not be saved in the bin; it will be discarded.

---

### **iFolder and NetDrive**

You must activate your iFolder account via the iFolder client before attempting to use NetDrive to access the iFolder server.

If you try to attach to iFolder for the first time using NetDrive, the connection will fail. You must first activate the account by attaching with either the Java applet (<https://nifl.your.domain.name.com/applet/java.htm>) or the iFolder client.

### ***How to Manage iFolder Servers***

Through the iFolder Management console, you can change your iFolder server's IP address, DNS name, or assigned ports.

Your first iFolder server is automatically added to the iFolder Management console for you. All additional iFolder servers must be manually added into the iFolder Management console in order for you to manage them.

You can have an unlimited number of iFolder servers.

To manage iFolder servers, you need to know how to do the following:

- Add iFolder Servers
- Set Global Server Policies
- Use Debug Output

### Add iFolder Servers

To add an iFolder server, do the following:

1. In the iFolder Management console, select **Global Settings**.
2. Log in with your Admin *username* and *password*.
3. Select *iFolder Servers* > *Add*.

The following appears:

Figure 6-11

The screenshot shows the iFolder Management console interface. On the left, a sidebar contains a 'Global Settings' section with links for 'General Info', 'Global Policies', 'Admin Names', 'User LDAPs', and 'iFolder Servers'. The main window displays the 'Add iFolder Server' dialog box. This dialog has two sections: 'Public' and 'Private'. The 'Public' section is for external access and includes fields for 'iFolder Server Name' (with a hint '(e.g., iFolder\_server00)'), 'Host DNS or IP', 'Port' (with a hint '(e.g., 80)'), and 'Secure Port' (with a hint '(e.g., 443)'). The 'Private' section is for internal server-to-server access and includes fields for 'Host DNS or IP' and 'Port' (with a hint '(e.g., 80)'). At the bottom of the dialog are 'Add' and 'Cancel' buttons.

To add a server, enter the following information:

- ❑ **Public and private iFolder server names.** If the DNS name or IP address of your iFolder server goes directly to the iFolder server without being routed through another device, meaning that your iFolder server is not behind a firewall, you are only required to fill in the information beneath the Public heading.

If the DNS name or IP address of your iFolder server goes through another device, like an L4 switch or a firewall which redirects the request to the iFolder server, you need to fill in the information under both the Public and Private headings.



---

If you have Network Address Translation (NAT) functionality built into your routers or switches, enter both your iFolder public and private DNS names and IP addresses.

---

If your public DNS name or IP address redirects requests to a private iFolder IP address, specify a DNS name (not an IP address) as the public address of the iFolder server.

Then, make sure you are using an internal DNS server to resolve the DNS name to the private address for internal users and use an external DNS server to resolve the DNS name to the public address of external users.

The Private settings allow the iFolder servers to communicate directly with each other within the iFolder system. The Public settings allow you to access the iFolder server from outside the firewall.

- ❑ **iFolder ports.** The ports that you enter into the iFolder Management console must match the ports that you specified during the iFolder installation.

You can have multiple iFolder servers using the same port numbers if they all have a unique DNS name or IP address.

Port 80 is used to send the encrypted username and password and data from the iFolder client to the iFolder server.

iFolder uses RSA\* encryption to encrypt the username and password, and Blowfish\* encryption to encrypt the user data. Port 443 is used to access the iFolder Management console and the Java applet via SSL and HTTPS.

4. When you finish, add the server by selecting **Add**.

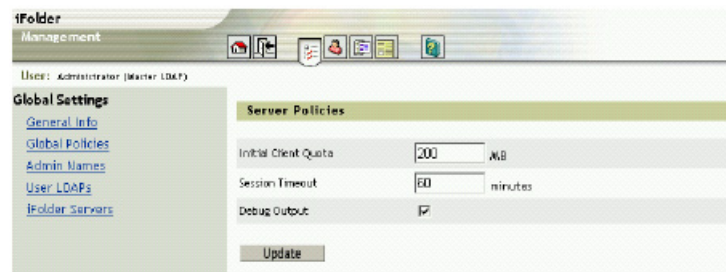
### Set Global Server Policies

You can regulate how much disk space will be allotted to each iFolder user or how much time will pass before a session times out by doing the following:

1. Log in to the Global Settings section of the iFolder Management console with your Admin *username* and *password*.
2. Select **Global Policies**; then select the **Display** button next to Server Policies.

The following appears:

Figure 6-12



3. Complete the following information:
  - **Initial Client Quota.** Specify the amount of storage space (in MB) that will be the minimum amount assigned to new iFolder user accounts.

- ❑ **Session Timeout.** Specify the maximum length of time (in minutes) that a session will be continued when there is no synchronization activity.

If the session times out, the client must go through a reconnect step before its next synchronization.

- ❑ **Debug Output.** Select the check box to enable synchronization activity to be logged and available for analysis.

4. When you finish, select **Update**.

### Use Debug Output

To use Debug Output for Linux servers, do the following:

1. Create a **logs** folder in **/var/opt/novell/ifolder/DocumentRoot/**.
2. Edit the **httpd\_ifolder\_unix.conf** file located at **/etc/opt/novell/ifolder**, and add the following parameter to the end of the file:

**iFolderServerLogging “/var/opt/novell/ifolder/  
DocumentRoot/logs/index.html”**

The debug information will go to the **index.html** file that is created for you in **DocumentRoot** under the **logs** directory.

3. Give Apache permissions to create and write to the log file by entering the following at the shell prompt:

**chmod 757 /var/opt/novell/ifolder/DocumentRoot/logs**

4. Restart the iFolder service so your changes to the conf file will take effect by entering the following:

**/etc/init.d/novell-httpd stop  
/etc/init.d/novell-httpd start**



5. To access this information, do one of the following:
  - ❑ In a browser on a workstation, enter the following:  
**`http://iFolder DNS or IP address/iFolder/logs/index.html`**  
For example  
`http://DA3.DigitalAirlines.com/iFolder/logs/index.html`
  - ❑ In a Linux browser on the iFolder server, enter the following:  
**`/var/opt/novell/ifolder/DocumentRoot/logs/index.html`**
  - ❑ At a shell prompt on the Linux iFolder server, enter the following:  
**`# tail -f /var/opt/novell/ifolder/DocumentRoot/logs/index.html`**

### ***How to Manage LDAP Servers***

Whenever you add an LDAP server through the iFolder Management console for user authentication, you are required to enter a name for the LDAP server, its DNS or IP address, a port number and, if necessary, the location of the root certificate.

You can have up to eight LDAP servers.

To manage LDAP servers for iFolder, you need to know how to do the following:

- Choose Port 389
- Choose Port 636
- Add LDAP Contexts

**Choose Port 389**

Choose port 389 if you want to use LDAP without SSL encryption or if your LDAP server does not support SSL.

Port 389 is also a good choice if iFolder and LDAP are running on the same server (no communication or data is being transferred across the wire, so no encryption is necessary).

If you choose port 389, the LDAP Group object must be configured to allow clear text passwords.

**Choose Port 636**

Choose port 636 if you want to use SSL to provide your network with encryption and security when data is transferred across the wire. SSL requires a root certificate.

If you choose port 636, make sure you have previously copied the rootcert.der file to the appropriate location on your system.

When you add a secure LDAP server to your iFolder system, the root certificate is copied into an attribute of the iFolderSettings class on the Global Settings LDAP.

**Add LDAP Contexts**

In the Contexts field, list all of the contexts, separated by semicolons (;) with no spaces.

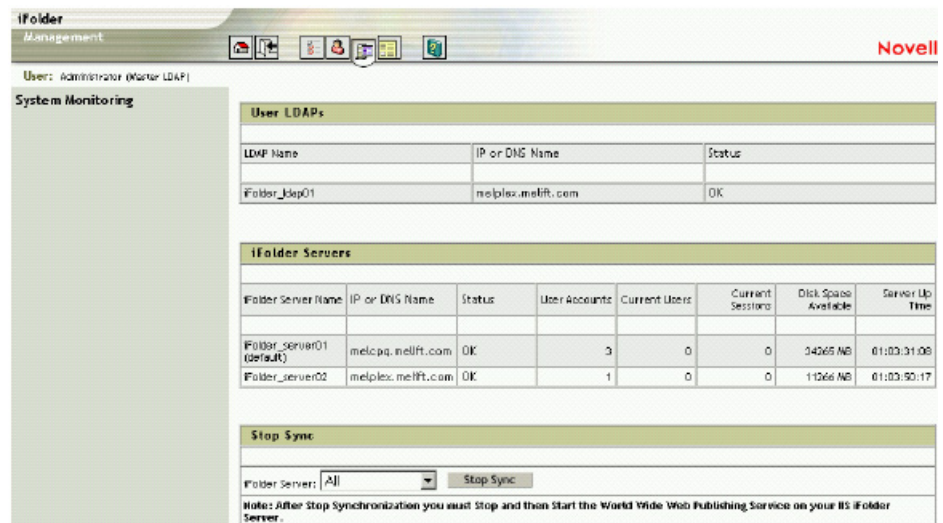
The order of the contexts is the order in which the contexts will be searched. The first context that is listed should be the context that contains the Admin user.

### *How to Monitor Your iFolder System*

To monitor your iFolder system, go to the iFolder Management console; then click System Monitoring.

The following appears:

**Figure 6-13**



This section of the iFolder Management console lists the following:

- **Each User LDAP server.** For each server, iFolder lists the IP address, the status, the number of LDAP users, and the number of iFolder users.
- **Each iFolder Server.** For each server, iFolder lists the IP or DNS name, status, number of user accounts, current users, current sessions, available disk space, and the amount of time the server has been up and running.
- **Stop Sync.** This option stops synchronization on a selected iFolder server.

## How to Generate Reports

Novell iFolder provides a report generator that lets you observe and assess information in the following categories:

**Table 6-2**

General Info	iFolder Servers	User LDAPs	User Accounts
Total Number of Users	iFolder Server Name	LDAP Name IP Address or DNS Name	Username iFolder Server Name
Total Disk Quota	IP Address or DNS Name	Status	Used Space
Total Disk Space Used	Server Up Time	LDAP Users	Quota
	iFolder Server Version	iFolder Users	Last Sync
	User Accounts		Files
	Current Users		Directories
	Current Sessions		Upload
	Total Disk Space Used		Download
	Total Disk Quota		Encryption
	iFolder Host OS		
	iFolder Host		
	Web Server		
	User Data		
	Application Root		

To run reports on your iFolder system

1. Go to the iFolder Management console; then select **Reporting**.

2. Select **General Info**, **iFolder Servers**, **User LDAPs**, or **User Accounts**.
3. Select **Export**.

A report such as the following iFolder User Accounts report appears:

**Figure 6-14**

The screenshot shows the iFolder Management console. On the left is a 'Reporting' sidebar with links for General Info, iFolder Servers, User LDAPs, and User Accounts. The main area is titled 'User Accounts' and shows a dropdown menu set to 'All' for 'Show user accounts on iFolder server'. Below this are 'Display' and 'Export' buttons. A table displays the following data:

Username	iFolder Server	Used Space	Quota	Last Sync	Files	Directories	Upload	Download	Encryption
otweil	iFolder_server01	236 MB	3000 MB	Feb 05 2003 21:11:11	15	4	20533 MB	20295 MB	No
source	iFolder_server01	0 KB	3000 MB	Feb 05 2003 13:59:17	0	1	30 MB	29 MB	No
wmpj	iFolder_server01	236 MB	3000 MB	Feb 05 2003 16:29:29	18	4	5874 MB	4214 MB	Blowfish
popeye	iFolder_server02	236 MB	3000 MB	Feb 05 2003 21:59:05	18	4	2729 MB	2686 MB	Blowfish

4. Save the displayed data to your hard drive in HTML format.
5. Import the data from 1 or more iFolder report files to another application such as OpenSource Writer.
6. Create statistics, graphs, and reports to suit your management needs.

**45 minutes**

## **Exercise 6-2    Configure and Test iFolder**

Organize students to do Part II one at a time on the workstation. This part of the exercise cannot be done on the NNLS server.

The first student to do Part II will install the client and use it to log in as an iFolder user. The second student will only be able to log in one of his or her iFolder users.

In this exercise, you do the following:

- Part I: Configure iFolder for Employee Access
- Part II: Install and Use the iFolder Client
- Part III: Configure iFolder to Log Debug Information
- Part IV: Change and Test the iFolder Configuration

### **Part I: Configure iFolder for Employee Access**

Do the following:

1. Configure the user context for your office employees:
  - a. From your NNLS server desktop, launch **Mozilla**; then enter the following:  
**`https://DAX.your container.DigitalAirlines.com/iFolderServer/Admin`**
  - b. Select **Global Settings**.
  - c. Log in as username **admin**, with the password **novell**.
  - d. At the left under **Global Settings**, select **User LDAPs**.
  - e. At the right, select **iFolder\_ldap01**.  
A properties page for iFolder\_ldap01 appears.  
Under **Contexts To Search**, you see the context listed for your container.
  - f. Enable the context by selecting the **check box** to the left of **o=your container**.
  - g. Enable subcontainer search by selecting the **Search Subcontexts?** check box.
  - h. When you finish, select **Update**.

The check mark in the box to the left disappears, indicating that the update was successful.

2. Enable your office employees to access iFolder:

- a. Select the **User Management** icon at the top of the page.
- b. At the left under **User Management**, select **Search**.

A Search for User page appears.

You are using the Search feature in this exercise because you only have a small number of employees to enable.

However, if you have many users you need to enable, use Advanced Search to find, select, and enable several users at the same time.

3. Enable the following employees:

- ☐ **cgrayson**
- ☐ **ddecker**
- ☐ **jjackson**

Do the following:

- a. Enter the first initial of the username in the search field (i.e, for cgrayson, enter **c**); then select **Search**.

A list of names appears.

- b. Select the first of the above **employees**; then, from the drop-down list, select **iFolder\_server01**.
- c. Select **Enable**.

The page is re-displayed with a Disk Quota of 200 MB for the user. A message also indicates that the account has not been activated by the user.

- d. Repeat these steps to enable the two other employees.

You have finished enabling your employees.

4. Log out of the iFolder Management console.

Students might notice that some of the employees in the list are already iFolder enabled (yellow with the red letter i).

Note that the difference is that objects that were imported in the LDIF are not already enabled and the users created in class are already enabled.

## Part II: Install and Use the iFolder Client

To install the iFolder client on your Windows workstation, do the following:



---

Since you and another student are sharing a Windows workstation, you will have to do this part of the exercise one at a time.

The first student will be able to install the client and log in as an iFolder user; the second student will only be able to log in as an iFolder user (starting with Step 12) because the client can only be installed once.

---

1. From Internet Explorer on your Windows workstation, go to your iFolder web site by entering the following:

**[https://DAX.your\\_container.DigitalAirlines.com/iFolder](https://DAX.your_container.DigitalAirlines.com/iFolder)**

The iFolder home page appears.



---

You can access the iFolder home page from a Mozilla browser, but you cannot do the following with NNLS v1:

- Download the client. The client is currently a Windows only client.
  - Use the Java applet and log in for web browser access to the iFolder server. The iFolder Java Applet is currently compatible only with Internet Explorer.
- 

2. At the left under iFolder Windows Client, select **Download**; then select **Open**.
3. On the Novell iFolder Setup welcome window, select **Next**.
4. Select your language; then select **Next**.  
The License Agreement appears in a browser window.
5. Close the browser window; then accept the license agreement by selecting **Yes**.



6. Install the iFolder client in the default folder (C:\Program Files\Novell\iFolder) by selecting **Next**.

7. Select **Finish**.

A readme file appears in a browser window.

8. Review the readme file; then close the window.

9. Make sure **Yes, I want to restart my computer now** is selected; then select **Finish**.

Wait for your workstation to restart.

A Welcome to Novell iFolder message appears with instructions for using the iFolder client.

10. Select **Continue**.

The Novell iFolder Login window for the iFolder client appears.

11. Enter the *User ID* and *password* of a Digital Airlines employee you enabled to use iFolder; then select **Login**.

A Novell iFolder Location window dialog appears. In this dialog you enter the folder on your workstation where you want to store files for synchronizing to the iFolder server.

The default location is \Documents and Settings\Student\My Documents\iFolder\username\Home.

12. (Conditional) Skip this step if you are the first student at your table to do this part of the exercise. If you are the second student, do the following:

- a. Go to the system tray and right-click the *iFolder icon*; then select **Logout**.
- b. Right-click the *iFolder icon* again; then select **Login**.
- c. Enter the *User ID* and *password* of a Digital Airlines employee you enabled to use iFolder; then enter the DNS name (**DAX.your.container.digitalairlines.com**) for your server.

d. Select **Login**.

A Novell iFolder Location window dialog appears. In this dialog, you enter the folder on your workstation where you want to store files for synchronizing to the iFolder server.

The default location is \Documents and Settings\Student\My Documents\iFolder\username\Home.

**13.** Accept the default location by selecting **OK**.

An Internet Folder Setup dialog appears.

**14.** Select **Enable automatic login at startup**; then make sure that **Encrypt files** is selected.

**15.** Continue by selecting **OK**.

A Get Pass Phrase dialog appears.

**16.** Enter and re-enter **novell** for the pass phrase.

**17.** Enter **oneNet** for the hint.

**18.** Continue by selecting **OK**.

A Pass Phrase Recovery dialog appears.

**19.** Make sure **Enable pass phrase recovery** is selected; then select **OK**.

You are logged in to iFolder.

Notice the iFolder client icon in the system tray.

**20.** Right-click the icon; then select **Account Information**.

A dialog appears with tabs that let you view and set iFolder client information.

**21.** Select the **View Activity** tab.

Scroll the window up, and notice that the iFolder client successfully contacted your iFolder server, and that an iFolder database was created on the iFolder server.

Also notice that synchronization happens frequently.

**22. Select the **Preferences** tab.**

Synchronization is set to occur automatically every 5 seconds for changes to your local files, and every 20 seconds for files that should be synchronized to your workstation.

**23. Deselect **Automatic sync**; then select **Apply**.****24. With the iFolder dialog still open, copy several files to the home directory of the user you logged in as (see the Account Information tab for the location).**

You might want to copy the pictures from the My Pictures folder.

**25. Return to the iFolder dialog and select the **View Activity** tab; then select the **Sync** button (top of the tab page).****26. Watch the messages as iFolder synchronizes the files to the iFolder server.**

After a few moments, a Synchronization Complete message appears.

The files are now encrypted and stored on the iFolder server.

**27. Turn **Automatic sync** back on; then select **Apply**.****Part III: Configure iFolder to Log Debug Information**

Now that users are logging in and out of iFolder and synchronizing files, you should configure iFolder to write debug information to a log file.

Do the following:

1. Open a terminal window and change to root by entering **su -** with a password of **novell**.
2. Enter **cd /var/opt/novell/ifolder/DocumentRoot**.
3. Enter **mkdir logs**.

4. Enter **ls -al** and verify that the logs folder is there.
5. Edit the **httpd\_ifolder\_unix.conf** file to start logging iFolder information:
  - a. Select **Applications > KDE Menu > System > File Manager - Super User Mode**.
  - b. Enter a password of **novell**; then select **OK**.
  - c. Browse to **/etc/opt/novell/ifolder**.
  - d. Right-click the **httpd\_ifolder\_unix.conf** file; then select **Open With > KWrite**.
  - e. Add the following to the end of the file:  
**iFolderServerLogging "/var/opt/novell/ifolder/DocumentRoot/logs/index.html"**
  - f. Save the **httpd\_ifolder\_unix.conf** file.
6. Give Apache permissions to create and write to the log file by entering the following at the shell prompt:  
**chmod 757 /var/opt/novell/ifolder/DocumentRoot/logs**
7. Restart the iFolder service by entering the following at the shell prompt:  
**/etc/init.d/novell-httpd stop**  
**/etc/init.d/novell-httpd start**
8. Enter **cd /var/opt/novell/ifolder/DocumentRoot/logs**.
9. Verify that the index.html file was created by entering **ls -al**.
10. Enter **tail index.html**.  
Note the iFolder Server Logging information that was captured.
11. Leave this *terminal session* open.

If the index.html is not created, have students create it and redo the chmod command on the index.html file; then restart the iFolder service.

## Part IV: Change and Test the iFolder Configuration

Now that you have installed the iFolder client, activated an iFolder user, and synchronized files, you can use the iFolder Management console to monitor and configure iFolder.

Do the following:

1. From your NNLS server Mozilla browser, access the iFolder Management console by entering the following:

**`https://DAX.your_container.digitalairlines.com/iFolderServer/Admin`**

A Novell iFolder welcome page appears.

2. Select **Reporting**.
3. Log in as **admin** with a password of **novell**.  
At the right under General Information, notice the total number of users.
4. At the left under **Reporting**, select **User Accounts**; then at the right select **Display**.  
Notice the data displayed for your activated iFolder user.
5. At the top of the page, select the **User Management** icon.
6. Enter the **User ID** for the iFolder user; then select **Search**.
7. Display the properties for the user by selecting the **User ID**.  
A properties page appears.  
Review the information displayed such as the disk quota, last sync, and used space.
8. Change the disk quota to **250 MB**; then select **Update**.
9. Scroll down to the bottom of the page and edit the client policies for the user by selecting **Edit**.

A policies page for the user appears with configurations for several of the settings available from the iFolder client.

10. For Automatic Sync, select **Enforced**.
11. For Save Pass Phrase, select **Hidden**.
12. For Sync to Server Delay, enter **30**; then select **Enforced**.
13. For iFolder Location, select **Hidden**.
14. Select **Update**.
15. Return to the *terminal session*; then enter **tail index.html**.

Note the debug output that was captured. Return to and refresh this window any time you want to see what kind of information is logged when iFolder events take place (i.e., logging out and back in, synchronizing files, etc.)

16. (Optional) In the File Manager - Super User Session, you can browse to and double-click the index.html file to see its full content and refresh it when needed.
17. Test the new configuration for the iFolder user:
  - a. From your Windows workstation, log out of the iFolder client by doing one of the following:
    - If your iFolder client dialog is open, select **File > Logout**.
    - If your iFolder client dialog is closed, right-click the iFolder client icon in the system tray; then select **Logout**.
  - b. Log in to your iFolder user by right-clicking on the **iFolder icon** in the system tray; then select **Login**.
  - c. For the iFolder user you changed settings for, enter the **user ID** and **novell** for the password; then select your server DNS name from the drop-down list.
  - d. Select **Login**.
  - e. For the pass phrase, enter **novell**; then select **OK**.
  - f. Right-click the iFolder client icon; then select **Account Information**.

- g. Select the **Account Information** tab.

Notice the following:

- ❑ The total space for the iFolder user on the server has increased to 250 MB.
- ❑ The iFolder location is still displayed. This is because the policy of hiding the location can only be applied to new accounts (there was a note on the Policies configuration page).

- h. Select the **Preferences** tab.

Notice the following:

- ❑ Automatic sync is grayed because it is enforced and cannot be deselected.
- ❑ The Synchronize to server delay is set (and grayed) for 30 seconds (instead of the 5 seconds default) and cannot be changed.
- ❑ The Remember Pass Phrase option is hidden.

- i. Select **File > Logout** to log out the iFolder user.

If you have time, try enabling, activating, and synchronizing files for the other 2 employees.

You can also experiment with changing other iFolder configurations from the client or the iFolder Management console.

- 18. Close** the Mozilla browser, the terminal session, and any other windows that are open.

*(End of Exercise)*

### Objective 3      **Describe the Purpose and Architecture of Samba**

Samba is a software package that implements Microsoft's SMB/CIFS networking protocols on Linux.

It allows a Linux machine to function as a Windows-compatible file server and to act as a client to other Windows servers.

To describe the purpose and architecture of Samba, you need to know the following:

- What Server Message Block (SMB) Is
- What Common Internet File System (CIFS) Is
- Samba and NNLS

#### ***What Server Message Block (SMB) Is***

Server Message Block (SMB) is a protocol for sharing resources between networked computers.

SMB can be implemented over a number of protocols including TCP/IP, NetBEUI, or IPX/SPX.



---

For more information about SMB, see  
<http://www.samba.org/cifs/docs/what-is-smb.html>.

---

#### ***What Common Internet File System (CIFS) Is***

CIFS is an implementation of SMB over native TCP/IP that does not require NetBIOS.



CIFS is a client/server protocol and is used by Microsoft Windows operating systems. It is also implemented on many other platforms (such as DOS, NetWare, UNIX®, Linux, and VMS™).

The advantages of using CIFS include the following:

- You do not need a Novell client to access files.
- You can use the client for Microsoft networks.
- All Windows operating systems support CIFS (must support IP).
- Most (if not all) applications do support CIFS (using native Windows networking).
- Implementation is available for many other platforms (such as Samba on UNIX/Linux).

### ***Samba and NNLS***

Samba is a suite of tools that lets you use Microsoft's SMB/CIFS networking protocol with Linux computers and other platforms.

With Samba installed, a Linux computer can function as the following:

- **Windows server.** Samba enables a server to provide Windows file and print services to users.
- **Windows client.** Samba enables a workstation to access and use Windows file and print services, whether they originate on a Windows server or a Linux server with Samba installed.

The Samba distribution installed with NNLS is customized specifically for NNLS and focuses on providing authenticated file services from the Linux server to users working on Windows client workstations.

This distribution is configured for the following functionality:

- Samba users are created in eDirectory using Linux User Management (LUM) tools included with NNLS.
- After you create users, you must specify a Samba password for each user, using either iManager or the smbpasswd utility.



---

In the final version of NNLS, you will be able to create Samba passwords in iManager.

---

- Home directories are automatically created and appropriate file access rights are automatically assigned the first time a LUM user logs in to the NNLS server from a text-based console.
- Access to Samba services requires that users authenticate using secure LDAP to the eDirectory server specified during NNLS installation.



---

This distribution has been compiled as an OpenLDAP client to use eDirectory's LDAP server for user authentication.

---

## **Objective 4    Install and Configure Samba**

To install and configure Samba, you need to know the following:

- Steps for Installing Samba
- How to Configure Samba
- How to Access Files Through Samba

### ***Steps for Installing Samba***

To install Samba on your Linux server, you need to do the following:

- Meet Samba Dependencies
- Gather Required Information
- Use the NNLS Install Feature

If you are providing Samba file services on the NNLS server to Windows users on your network, you must also install Linux User Management (LUM).

Linux User Management lets you create eDirectory users that can then access the NNLS server.

### **Meet Samba Dependencies**

Samba is dependent on the following NNLS component:

- eDirectory 8.7.1 or later anywhere within the network

If this component is not already installed, you do not have to install it before installing Samba.

The NNLS install program will select the required component, along with its dependencies, if any, when you select the Samba component. Samba and the component it is dependent on will both be installed in the same process.

See Table 2-5 for required information you need to gather to successfully install any Samba dependencies that are not already installed.

## Gather Required Information

The following describes the information you need to know before installing Samba:

**Table 6-3**

Configuration Data Required	Description
eDirectory Server IP Address or DNS Hostname	<p>The IP address or DNS name of the server on which you are installing iFolder.</p> <p>The primary IP address of the eDirectory server to which Windows users will authenticate using LDAP authentication for access to the directories and files on the NNLS server.</p>
Admin Name with Context	<p>The fully distinguished name of the Admin for the eDirectory server specified for Samba.</p> <p>The name and context must be specified using typeful syntax (<i>cn=name.ou=organizational-unit.o=organization</i>).</p>
Admin Password	The password for the Admin.
LDAP Server IP Address or DNS Hostname	The primary IP address of the eDirectory server to which Windows users will authenticate using LDAP authentication for access to the directories and files on the NNLS server.
Samba Proxy User Name with Context	<p>The name of the proxy user you want eDirectory to configure for Samba.</p> <p>The installation script creates this user object for you.</p>
Samba Proxy User Password	The password for the Samba proxy user.

**Table 6-3** *(continued)*

Configuration Data Required	Description
LDAP Port Number	The LDAP port through which Windows users will authenticate to the eDirectory server for access to the directories and files on the NNLS server being installed. The default value is 389.
Secure LDAP Port Number	The secure LDAP port through which Windows users will authenticate to the eDirectory server for access to the directories and files on the NNLS server being installed. The default value is 636.
Certificate CA File (optional)	The Trusted Root Certificate file (ROOTCERT.DER) you extracted from any of the eDirectory tree's SSL Certificate objects, in base64 format. This must be done if you installed the NNLS server into an existing tree.

### Use the NNLS Install Feature

To install Samba from NNLS, do the following:

1. Perform the steps to do a custom installation.



If necessary, see Section 2 for details on how to perform a custom installation.

2. Deselect the services you *do not want* to install, select the Samba service, and then continue.

If eDirectory has not previously been installed, notice that it is selected by default when you select Samba.

If eDirectory has been previously installed, the install program will indicate which components are already installed.

3. Accept the license agreement.
4. (Conditional) If prompted for the location of the NICI Foundation Key (NFK) file, insert the license diskette and enter the path to the NFK file.

You will only be asked for the NICI Foundation Key if eDirectory has not previously been installed.

5. Enter the information requested at each prompt (see Table 6-3).

Each prompt includes a default value (such as [DA-TREE]). You can accept the default value and continue by pressing Enter.

6. View the summary information and make any necessary corrections.
7. When all the information is correct, finish the installation.
8. View the readme file and save the installation settings log file.

**5 minutes**

### ***Exercise 6-3    Confirm That Samba is Installed on Your NNLS Server***

In this exercise, you confirm the presence of the smb.conf file and the novell-smb service.

Do the following:

1. From a terminal session, log in as root (**su -**) with a password of **novell**.
2. Enter **cd /etc/opt/novell/samba**.
3. Enter **ls -al**.

The smb.conf file should appear in the list.

4. Enter **cd /etc/init.d**.
5. Enter **ls novell-**; then press **Tab** twice.

The novell-smb service should appear in the list.

*(End of Exercise)*

### ***How to Configure Samba***

The Samba distribution included with NNLS consists of RPMs and configuration files.



---

NNLS includes a Novell-customized version of the Samba package (novell-samba-2.2.8a . . .).

In compliance with Samba standards, Novell added the switches -with-ldapsam and -with-ssl and recompiled Red Hat's RPM to provide secure LDAP authentication support for Samba users.

---

To configure Samba, you need to know how to do the following:

- Create and Provision Users for Samba Services
- Configure the smb.conf File
- Configure the ldap.conf File

### Create and Provision Users for Samba Services

To create and provision users for Samba service access on the NNLS server, do the following:

1. Create a LUM user account for each user you want to have Samba access; then do the following:
  - Create a LUM group
  - Assign passwords to the LUM users
  - Create home directories for the LUM users



---

Users must be LUM enabled before they can be provisioned for Samba services.

---

2. Log in to the NNLS server as root.
3. If you want to change any of the default Samba configuration settings (such as the workgroup name), use a text editor to modify the **smb.conf** file in **/etc/opt/novell/samba**.
4. Samba enable each user you want to have Samba access. You can do this in each of the following ways:
  - **Use the *smbpasswd* utility at the command line.** This is the standard Samba utility for creating Samba users and setting their passwords.





For Samba in NNLS, Novell recommends that you use the Linux User Management (LUM) functionality in iManager to create users.

For more information on the smbpasswd utility, see the smbpasswd man page. Keep in mind, however, the limited function that Novell has specified for this utility in NNLS.

---

The syntax for the smbpasswd utility is

**`/opt/novell/bin/smbpasswd -a username`**

where ***username*** is the LUM username for which you are creating the Samba password.

- ❑ **Enable them as Samba users at the same time you create them in iManager.** This option is available in the same dialog that asks you to LUM enable a user (as shown in Section 4.)
- ❑ **Convert them to Samba users after they are created and LUM enabled.** This option is available when you convert an eDirectory user to a LUM user in iManager.

If you LUM enable users but opt not to Samba enable them at that time, you can always use iManager or the smbpasswd utility to convert a LUM user to Samba at a later time.

##### 5. Specify and confirm the password.

When a user is Samba enabled, their schema is extended to include a Samba profile. The Samba password is the only value given to the Samba profile.

To avoid confusion, we recommend you use the same password you used for the eDirectory user password.

All users whose accounts have been enabled for Samba access should now be able to access shares on the NNLS server as they would folders on a Windows server.

## Configure the smb.conf File

In compliance with Linux Standards Base (LSB) requirements, Novell places the Samba configuration file (smb.conf) in the /etc/opt/novell/samba directory on the NNLS server.

Novell's implementation of Samba requires that the smb.conf file contain the following entries (which can be edited with a text editor):

**Table 6-4**

Section	Entry Name	Description
[global]	ldap admin dn =	<p>Specifies the Distinguished Name (DN) that Samba uses for contacting eDirectory's LDAP server to retrieve user account information for users requesting access to Samba shares.</p> <p>The password for the DN specified at install time is encrypted by the installation process and stored in the secret store (secrets.tdb) on the NNLS server.</p> <p>If the DN name is changed in eDirectory, the name specified in this file must be changed as well.</p> <p>If the DN password is changed, the new password must be stored using the smbpasswd command.</p> <p><b>Example:</b> ldap admin dn = cn=admin,o=novell</p>
	ldap ssl =	<p>Specifies that Samba should use SSL for communications with the LDAP server (eDirectory).</p> <p>Secure LDAP requires that this be set to on.</p> <p><b>Default:</b> ldap ssl = on</p>

Table 6-4

Section	Entry Name	Description
	ldap port =	<p>Specifies the port used for secure LDAP communications between Samba and the LDAP server (eDirectory).</p> <p>This value can be changed if your network uses a different port for secure LDAP communications.</p> <p><b>Default:</b> ldap port = 636</p>
	ldap server =	<p>Specifies the LDAP server's hostname.</p> <p>Either the full DNS name or the IP address can be used.</p> <p><b>Example:</b> ldap server = nnls.provo.novell.com</p> <p><b>Default:</b> ldap server = <i>IP address</i> where <i>IP address</i> is the IP address of the eDirectory server.</p>
	security =	<p>This specifies the security mode.</p> <p>The value must be set to <i>user</i>.</p> <p>For more information, see <a href="http://www.samba.org">www.samba.org</a>.</p> <p><b>Example:</b> security = user</p>
	encrypt passwords =	<p>This specifies that passwords received from Windows clients will be encrypted.</p> <p>This value must be set to <b>yes</b>.</p> <p>For more information, see <a href="http://www.samba.org">www.samba.org</a>.</p> <p><b>Example:</b> encrypt passwords = yes</p>
	workgroup =	<p>This specifies the Windows workgroup that the Samba server will either join (if it exists) or effectively create (if the name is new).</p> <p><b>Example:</b> workgroup = workgroup</p>
	netbios name =	<p>This is the LDAP name and context of the LDAP (eDirectory) server used for secure LDAP authentication.</p> <p><b>Example:</b> netbios name = cn=hamachi,o=novell</p>

**Table 6-4**

Section	Entry Name	Description
[homes]	comment =	This specifies the name that appears after the Samba server name in Network Neighborhood on the Windows client. If this and the following 2 entries are set as specified, there is no need to specify individual shares for users' home directories. <b>Default:</b> comment = Home Directories
	browseable =	This specifies whether all the home directories will appear in Network Neighborhood. <b>Default:</b> browseable = no
	writable =	This specifies whether users can create and modify files. <b>Default:</b> writable = yes
Shares (optional)	[Share Name] path = read only =	You can create new shares by adding entries of this type to the smb.conf file. <b>Example:</b> [DATA] path = /export/data read only = no  The simple example creates a new share called DATA at the point /export/data in the local file system. This share is exported with Read/Write access.  There are many other options that can be set for a share. See the Samba documentation at <a href="http://www.samba.org">http://www.samba.org</a> .

### Configure the ldap.conf File

Samba on Linux uses the OpenLDAP client libraries libldap.so and libldap\_r.so. ldap.conf is the configuration file for OpenLDAP.

In compliance with Linux Standards Base (LSB) requirements, Novell places the `ldap.conf` file in the `/etc/opt/novell/openldap` directory on the NNLS server.

If you install the NNLS server into an existing tree, you must specify a trusted root certificate during NNLS installation. The `ldap.conf` file on your NNLS server will then have the following certificate-related entries:

- `TLS_CACERT /etc/ssl/certname.cert`
- `TLS_REQCERT demand`

If you are installing a new directory tree, the `ldap.conf` file will have the following entry:

- `TLS_REQCERT allow`



For more information on the `ldap.conf` file, see the `ldap.conf` man page.

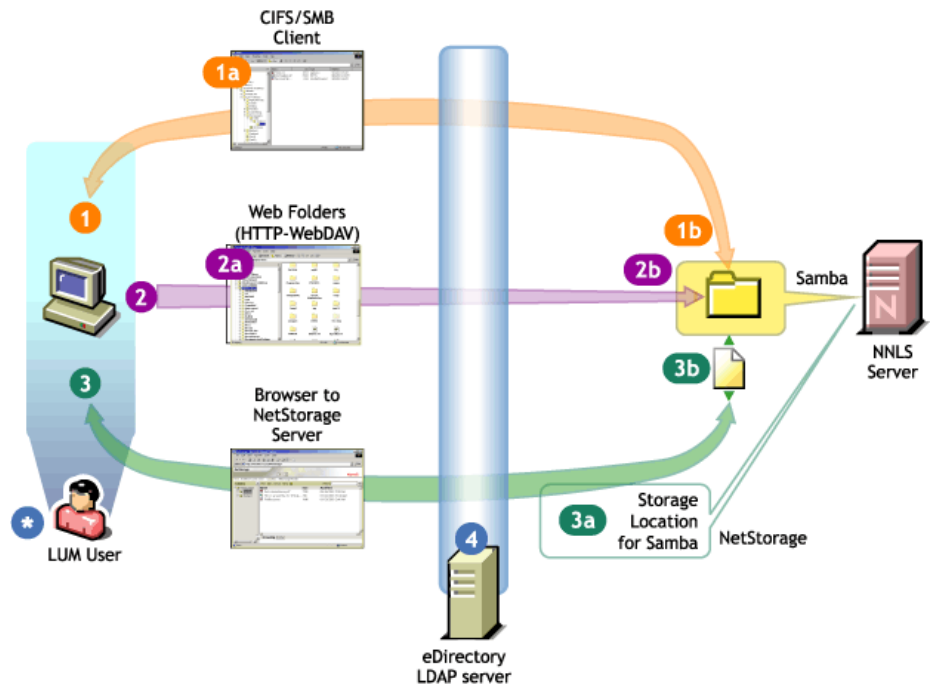
---

### ***How to Access Files Through Samba***

Only users defined as Linux User Management (LUM) users can authenticate through the LDAP server and access Samba files on the NNLS server.

The following illustrates the three options for accessing Samba files:

**Figure 6-15**



1. Windows users can access Samba files using Windows Explorer:
  - a. Users navigate to the Samba share in the normal way.
  - b. Files on the NNLS server are accessed and maintained using Microsoft's CIFS protocol.
2. Windows users can also access Samba files by creating a Web folder.
  - a. Users create a Web folder to the Samba server in the normal way.
  - b. Files on the NNLS server are accessed and maintained using the HTTP-WebDAV protocol.

3. Browser users can also access their Samba files for downloading to their local file systems.
  - a. To provide browser access to Samba files, you must also install NetStorage and create a Storage Location for the Samba server.
  - b. Browser users can download files for viewing and/or modifying. They can then upload modified files. They cannot, however, modify the files directly.

All file service access is controlled by LDAP-based authentication through eDirectory's LDAP server.

For example, to access files on an NNLS server from a Windows workstation, do the following:

1. Enter your username (no context) and local password to log in to the workstation.
2. Access the network by doing one of the following:
  - In Windows 2000 or Windows ME, select **My Network Places > Computers Near Me**.
  - In Windows 95/98, select **Network Neighborhood**.
3. Browse to the workgroup or domain specified during the NNLS installation.
4. Select the server running NNLS protocols.

If you are prompted to log in, use the user's simple password.



---

Microsoft Networking Client needs to be installed.

---

To map a drive from Microsoft Windows to files on an NNLS Linux server, use the following steps for Windows NT/2000 as an example:

1. Enter your username and local password to log in.

2. Right-click the **Network Neighborhood** icon (or **My Network Places**).
3. Select **Map Network Drive**.
4. Select a *drive letter*.
5. Enter the path (*\\name of server\sharepoint*).
6. Select **Map**.

To map a drive from Novell Client 4.9 for Windows to a Samba share on an NNLS server, do the following:

1. Turn off the UNC Path Filter:
  - a. Right-click the red **N**; then select **NetWare Client Properties**.
  - b. Select **Advanced Settings**.
  - c. Scroll down to and select the **UNC Path Filter** parameter group.
  - d. Change the setting to **Off**; then select **OK**.
  - e. Restart the workstation.
2. Map the Samba share as a network drive:
  - a. Right-click the red **N**; then select **Novell Map Network Drive**.
  - b. Select a *drive letter*.
  - c. Enter the path (*\\name of server\sharepoint*).
  - d. Select **Map**.



**30 minutes**

### ***Exercise 6-4    Configure Samba for Digital Airlines Employee Access***

In this exercise, you configure Samba access for employees in your container by doing the following:

- Part I: Create and Provision a User for Samba Services
- Part II: Access Files on the NNLS Server from a Windows Workstation
- Part III: Convert an Existing eDirectory User to LUM and Samba
- Part IV: Configure the /tmp Directory as a Shared Directory

#### **Part I: Create and Provision a User for Samba Services**

Create a users and provision this user for Samba services by doing the following:

1. View the settings in the smb.conf file:
  - a. Select **Applications > KDE Menu > System > File Manager - Super User Mode**.
  - b. Enter a password of **novell**; then select **OK**.
  - c. Browse to **/etc/opt/novell/samba**.
  - d. Right-click the **smb.conf** file; then select **Open With > KWrite**.

Notice the workgroup name (“workgroup”).
  - e. Scroll down (a little more than 1/3 of the way into the file to Passwords & Authentication) and review “**Entry made by NNLS install.**”

These parameters were set based on information you provided during installation.
  - f. Select **File > Quit**.

**2.** Open iManager and create a user with the following properties:

- ☐ Username: **SUser**
- ☐ First name: **Samba**
- ☐ Last name: **User**
- ☐ Context: ***your container***
- ☐ Password: **novell**
- ☐ Primary Group (for LUM): **DBUSERS,*your container***
- ☐ Also convert this user to a Samba user: ***(leave selected)***
- ☐ Samba Password: **novell** (entered by default)

**3.** Create a home directory for SUser:

- a. Press **Ctrl+Alt+F2**.
- b. Log in as **SUser**; password **novell**.

SUser's home directory folders are created and SUser is LUM enabled.



---

If you receive an "Incorrect login" error, refer to the LUM troubleshooting steps in Exercise 4-4.

---

- c. Enter **logout**.
- d. Press **Alt+F7** to return to the desktop.

## **Part II: Access Files on the NNLS Server from a Windows Workstation**

Do the following:

- 1.** Access files on your NNLS server from the Windows XP workstation:
  - a. At the XP workstation, right-click **Start**; then select **Explore**.
  - b. From the menu bar, select **Tools > Map Network Drive**.

- c. In the Folder field, enter **\\DNS name\SUser**.

If your server is DA3, enter  
\\da3.atl.digitalairlines.com\SUser

- d. Before you select Finish, select **different user name**.
- e. Log in as **SUser** with **novell** as the password; then select **OK**.
- f. Select **Finish**.

You should now see your user's home directory.

2. Add files to the home directory from the XP workstation:

- a. Right-click in the home directory window and create any of the following:
  - **New > Folder**
  - **New > Document**
  - **New > Image**

3. On the NNLS server, verify that the files are there by navigating the tree to **/home/username**.

You should see all the folders and/or files that you created from the Windows XP workstation.

4. Return to the Windows XP workstation's Explorer window and disconnect SUser's mapped drive:

- a. Close **the window** to the mapped drive.
- b. From the Windows Explorer menu, select **Tools > Disconnect Network Drive**.
- c. Select SUser's **mapped drive**; then select **OK**.

Windows will only allow you to have one drive mapped to a share at a time. With NNLS servers, access to user's home directories is done through the [homes] share that is configured in smb.conf.

With two students from different servers accessing Samba shares through the same workstation, you will not have problems with the drive mappings to shares on other servers. But you will have problems mapping more than one user's home directory from the same server.

For example, you cannot leave SUser's home directory mapped and still do the next part of this exercise.

### Part III: Convert an Existing eDirectory User to LUM and Samba

To explore the process of converting an existing user (a user object that was imported from an LDIF file) to both LUM and Samba, do the following:

1. From your NNLS server, browse the tree for *a user* you have not used in any previous exercises (i.e., KHart); then record the username in the space below:
2. View the user's properties by using the **Modify Object** link and scroll to the bottom of the **General** drop-down menu.  
You should see that there are no Linux or Samba profile pages.
3. Using the link under Linux User Management, convert *the user* to a LUM user.
  - ❑ Use **DBUSERS.your container** as the primary group
  - ❑ **Deselect** Samba before you select **OK**.
  - ❑ Create a home directory for this user by pressing **Ctrl+Alt+F2** and logging in at the shell prompt.
  - ❑ Logout and return to the desktop.
4. View the user's properties by using the **Modify Object** link and scroll to the bottom of the **General** drop-down menu.  
You should see that there is now a Linux Profile page.

5. Using the link under Linux User Management, convert *the LUM user* to a Samba user.

- Use **novell** as the password

6. View the user's properties by using the **Modify Object** link and scroll to the bottom of the **General** drop-down menu.

You should see that there is now a Linux Profile page and a Samba Profile page.

7. Use the XP workstation to map a drive to this user's home directory.

Make sure that any previously mapped drives are disconnected.



---

If all the mapped drives are disconnected and Windows still returns an error saying that you can only have one drive mapped to a share, then you might need to log off Windows and log back on again.

---

#### Part IV: Configure the /tmp Directory as a Shared Directory

Allow authenticated users to access the /tmp directory for the purpose of sharing files, by doing the following:

1. Open the smb.conf file for editing:
  - a. Select **Applications > KDE Menu > System > File Manager - Super User Mode**.
  - b. Enter a password of **novell**; then select **OK**.
  - c. Browse to **/etc/opt/novell/samba**.
  - d. Right-click the **smb.conf** file; then select **Open With > KWrite**.
2. Edit smb.conf to make /tmp available to authenticated users:
  - a. Scroll down to the **Share Definitions** section and find the comment that says **#This one is useful for people to share files**.

- b. Remove the # sign to uncomment the following lines:

```
[tmp]
comment = Temporary file space
path = /tmp
read only = no
public = yes
```

- c. Select **File > Save**; then select **File > Quit**.

3. Restart the Samba service:

- a. Stop the Samba service by entering **/etc/init.d/novell-smb stop**.
- b. Start the Samba service by entering **/etc/init.d/novell-smb start**.

4. Test access to /tmp as a shared directory:

- a. On the XP workstation, from the Explorer menu bar, select **Tools > Map Network Drive**.
- b. In the Drive field, enter **Y:** (if you're the second student to do this part of the exercise, use drive **Z:**).
- c. In the Folder field, enter **\\DNS name\tmp**.  
If your server is DA3, enter  
**\\da3.atl.digitalairlines.com\tmp**
- d. Before you select Finish, select **different user name**.
- e. Log in as **SUser** with **novell** as the password; then select **OK**.
- f. Select **Finish**.
- g. You should now see the **/tmp** directory.
- h. Save a test document to this directory and verify that it is seen from both the Linux and the XP workstation.



---

You should not have to disconnect drives mapped to the /tmp directory because no other exercises will require that you map a drive to this share.

You use the mapped drive to the /tmp directory if you choose to do the optional part of Exercise 7-1.

---

*(End of Exercise)*

## **Objective 5      Describe the Role and Function of NetStorage**

NetStorage provides secure Internet-based access to files and folders on Linux, Windows, and NetWare servers in your network through a browser.

NetStorage authentication relies on Novell eDirectory authentication to provide secure access, so Internet-based access is as secure as accessing files from within the network.

To describe the role and function of NetStorage, you need to understand the following:

- NetStorage Benefits
- How NetStorage Works
- What Users See When They Access NetStorage

### ***NetStorage Benefits***

Novell NetStorage includes the following benefits:

- Lets users securely copy, move, rename, delete, read, and write files between any Internet-enabled computer and the servers on your network
- Eliminates the need to use a virtual private network (VPN) client to access files
- Eliminates the need to email or copy data from one computer to another
- Supports Internet standards such as HTTP, HTTPS, HTML, XML, and WebDAV
- Supports file protocols such as CIFS, Samba, and NFS.
- Supports access to users' Novell iFolder accounts
- Provides access to network files and folders via Novell Virtual Office
- Supports Storage Location objects used to display, through a Web browser, a specified name for the NetStorage directory

With NetStorage installed on one Linux server with Novell Nterprise Linux Services, users can potentially have access to any Linux or NetWare server anywhere on your geographically dispersed network.

### ***How NetStorage Works***

NetStorage is installed on one Linux server that acts as a Middle Tier (also known as XTier) server. Xtier is Novell's Web services framework and is used by various Novell products.

See "How NetStorage Works" in the *NetStorage Administration Guide*, which is available at <http://www.novell.com/documentation/lg/nnls/index.html>.



Middle Tier server configuration information is stored in the `/etc/opt/novell/xtier/xtier_registry.xml` file on the Linux server. Novell iManager provides an easy method for changing Middle Tier configuration.



Previous versions of NetStorage were administered using the NSAdmin utility. Configuration should now be done through Novell iManager.

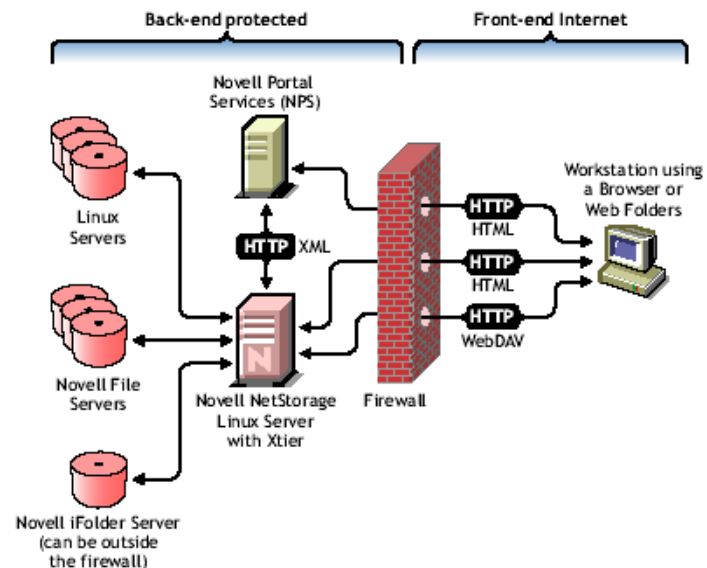
After the Middle Tier server is set up, it appears as an Internet Web server to users and can be accessed through a web browser. For example, the NetStorage service on NNLS can be accessed through Virtual Office, or at the following URL:

`HTTPS://IP address or domain name/NetStorage`

NetStorage also includes a gadget that provides access through Novell exteNd Director 4.1 Standard Edition.

The following illustrates how NetStorage works on this middle tier:

Figure 6-16



The Middle Tier server communicates with the NetWare or Linux servers in the network and provides secure authentication using eDirectory and the users' usernames and passwords.

After authentication, when a user is trying to access a Samba share on a Linux server, NetStorage also checks the Samba configuration to see what the user's permissions are to the share. For this reason, users must be Samba enabled before they can access a Samba share.

A notable exception to the Samba-enabled requirement is the NetStorage **shared** directory, which is discussed later in this section.

NetStorage also provides secure access to files that users have located on Novell iFolder servers.



---

Users must have their iFolder user accounts enabled through the iFolder server in order to access their files stored in iFolder using NetStorage. You must also enable users to set iFolder passphrases in NetStorage.

iFolder 2.1 does not support 56-bit encryption. If you are using 56-bit encryption, you must use iFolder 1.03.

---

All transactions can also be encrypted using SSL to increase the security. Novell iFolder transactions are secured using the iFolder encryption mechanism.

### ***What Users See When They Access NetStorage***

NetStorage allows certain access by default while additional access can be configured and must meet certain requirements. In this topic we will discuss the following:

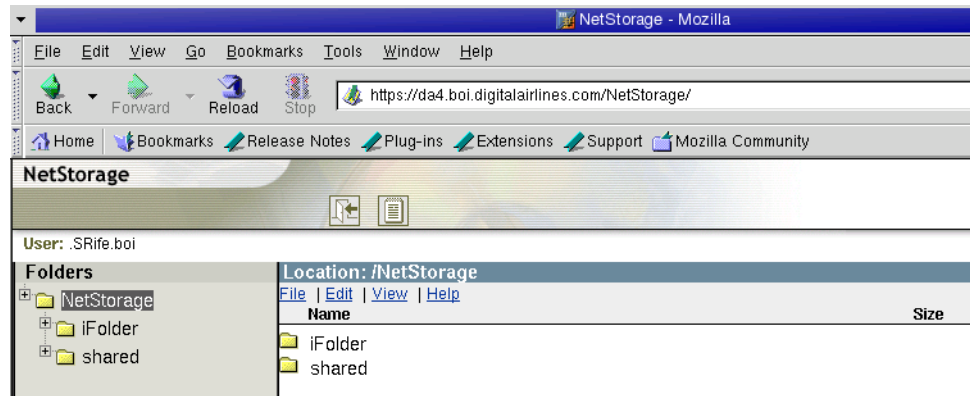
- Default NetStorage Access
- Additional Configured NetStorage Access

## Default NetStorage Access

The NetStorage Web page displays the network files and folders.

The following illustrates folders accessible by default from the NetStorage web page:

**Figure 6-17**



The **shared** folder, shown in Figure 6-17, is a default NetStorage location that all users can access for uploading or downloading files. Users do not have to be Samba-enabled to access this folder.

NetStorage is automatically configured to give all eDirectory users access to the **shared** folder on your NNLS server. The path to this folder is

**`/var/opt/novell/netstorage/shared`**

## Additional Configured NetStorage Access

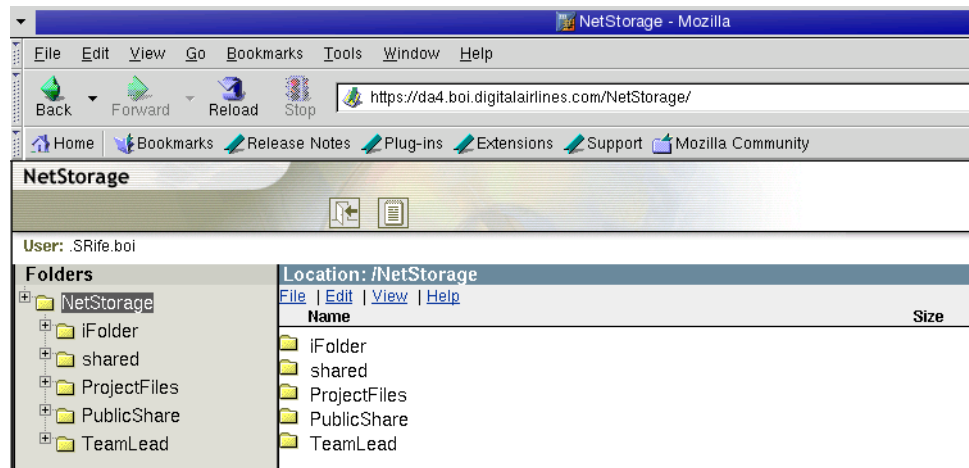
You can create folders that only specific users have access to. You do this by creating Storage Location objects that point to folders on Linux and NetWare servers.

Users might be granted Linux file system rights and permissions to certain folders on the NNLS server but they will not be able to access them using NetStorage unless the following conditions are met:

- The user is Samba enabled.
- In the case of folders you specifically create for NetStorage users, the folders must be configured as Samba shares in the smb.conf file.
- In the case of user's home directories, they are already configured as a Samba share by default. But if you want to give a user access to a home directory through NetStorage, you must create the home directory by logging in as a LUM user.
- Storage Location objects have been created and configured to point to the Samba share.
- The user is given an assignment to the Storage Location object. This can be done on an individual user level, or it can be done through group, container, or other similar assignments.

The following illustrates additional folders that have been configured to be accessible from the NetStorage web page:

**Figure 6-18**



## Objective 6    **Install and Configure NetStorage**

To install and configure NetStorage, you need to know the following:

- Steps for Installing NetStorage
- Creating Storage Location Objects and Lists
- Configuring NetStorage
- Accessing NetStorage Files and Folders

### ***Steps for Installing NetStorage***

The general steps for installing iFolder are

- Meet NetStorage Dependencies
- Gather Required Information
- Use the NNLS Install Feature

### **Meet NetStorage Dependencies**

NetStorage is installed with Virtual Office. The dependencies for Virtual Office include

- Apache 2.0.45 on the same NNLS server
- JVM 1.4.1\_02 on the same NNLS server
- Tomcat 4.1.24 on the same NNLS server
- eDirectory 8.7.1 or later anywhere within the network
- iManager 2.0 on the same NNLS server

The NNLS install program will select the required components, along with their dependencies, when you select the Virtual Office component. They will all be installed in the same process.

See Table 2-5 for information needed to successfully install any Virtual Office dependencies that are not already installed.

For most networks, you need NetStorage installed on only one server; however, this might vary depending on size and your organization's needs.

For example, if your company is geographically dispersed, you might want to install NetStorage on one server in each geographic region.

### Gather Required Information

The following table describes the NetStorage information requested during a Virtual Office installation:

**Table 6-5**

Configuration Data Required	Description
NetStorage Authentication Server	The IP address or DNS hostname of the eDirectory server to which NetStorage users authenticate using LDAP.
NetStorage Proxy User	The fully distinguished name of a user object with rights to do the following: <ul style="list-style-type: none"><li>■ Search the LDAP (eDirectory) tree specified as the NetStorage Authentication Server for NetStorage users</li><li>■ Store the iFolder user pass phrase in eDirectory the first time users access the storage location, if an iFolder storage location is defined in NetStorage</li></ul>
NetStorage Proxy User Password	The password for the user specified as the NetStorage Proxy User.

**Table 6-5** *(continued)*

<b>Configuration Data Required</b>	<b>Description</b>
NetStorage Users Context	The context on the NetStorage Authentication Server to be searched for NetStorage users.  (All subcontexts are also searched.)
iFolder Server IP Address or Hostname	(Optional) Specifies the IP address or hostname of the iFolder server you want created as a storage location in NetStorage. This makes iFolder automatically available to Virtual Office users.

### Use the NNLS Install Feature

To install NetStorage (part of the Virtual Office installation) from NNLS, do the following:

1. Perform the steps to do a custom installation.



If necessary, see Section 2 for details on how to perform a custom installation.

2. Deselect the services you *do not want* to install, select the Virtual Office service, and then continue.

If eDirectory has not previously been installed, notice that it is selected by default when you select Virtual Office (along with other required components such as Apache and Tomcat).

If eDirectory has been previously installed, the install program will indicate which components are already installed.

3. Accept the license agreement.

4. (Conditional) If prompted for the location of the NICI Foundation Key (NFK) file, insert the license diskette and enter the path to the NFK file.

You will only be asked for the NICI Foundation Key if eDirectory has not previously been installed.

5. Enter the information requested at each prompt (see Table 6-5).
6. View the summary information and make any necessary corrections.
7. When all the information is correct, finish the installation.
8. View the readme file and save the installation settings log file.

### ***Creating Storage Location Objects and Lists***

After installing NetStorage, you might only be able to see your iFolder directory and a local shared directory on the Linux server using NetStorage.

Storage Location objects are required for accessing files and directories on Linux servers and can also be used on NetWare servers.

Users might have specific eDirectory rights to certain files and folders on your network but will not be able to access those files and folders using NetStorage unless storage location objects have been created.

To give users file access, you need to know how to do the following:

- Create a Storage Location Object
- Create a Storage Location List



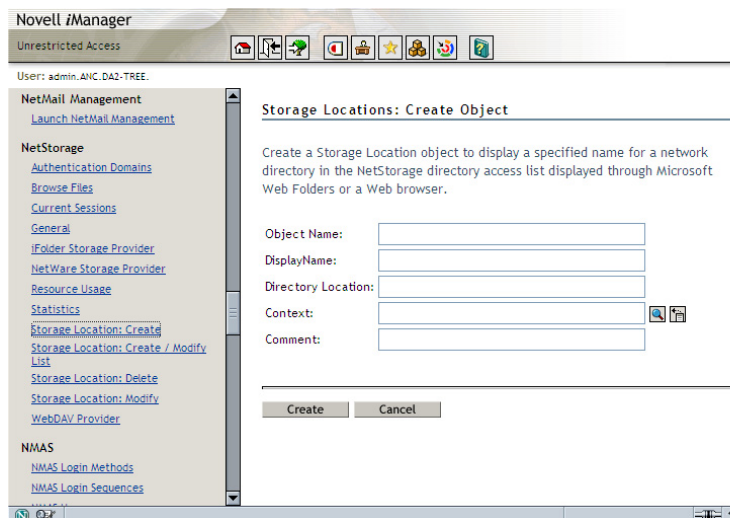
## Create a Storage Location Object

To create a storage location object, do the following:

1. Launch a browser and start iManager by entering the following:  
**https://IP\_or\_DNS/nps/iManager**
2. Log in by entering your *username* and *password*.
3. At the left under **File Access (NetStorage)**, select **Storage Location: Create**.

The following appears:

Figure 6-19



4. Enter the following:
  - ❑ **Object name:** The name of the object in eDirectory.
  - ❑ **Display name:** The name to be displayed in the NetStorage directory access list.

This is the shortcut name and is seen by users. If you use the same display name for 2 different storage objects, a digit is added to the names to make each name unique.

- ❑ **Directory location:** The location of the directory on the file system. The location is a URL that includes the file system type, server name, volume, and directory path.

If the storage being accessed is on a NetWare server, the URL must be in the following format:

**ncp://server\_name/volume/path\_to\_directory**

For example:

**ncp://server1.digitalair.com/mktg/reports**

*or*

**ncp://111.222.3.4/mktg/reports**

If the storage being accessed is on a Linux server, the URL must be in the following format:

**cifs://server\_name/cifs\_share\_name**

If the file system is omitted, it is assumed that it is NCP.

- ❑ **Context:** The directory context that the Storage Location object resides in.  
You can select the Object Selector icon to browse to and select the context.
- ❑ **Comment:** For the administrator only; it is not displayed to users.

5. When you finish, select **Create**; then select **OK**.

### Create a Storage Location List

After you create a storage location object, you must create a list of storage location objects that can be used with a specified user, group, profile, or container object.

Users see the directory associated with the object the next time they log in. After this list is created, you can modify it from the same window by assigning additional storage location objects to the list or by deleting storage location objects from the list.

To create a storage location list, do the following:

1. Launch a browser and start iManager by entering the following:  
**`https://IP_or_DNS/nps/iManager`**
2. Log in by entering your *username* and *password*.
3. At the left under **File Access (NetStorage)**, select **Storage Location: Create/Modify List**.
4. Select the **Object Selector** button; then browse to and select the user, group, profile, or container object that the list is to be created for.
5. When you finish, select **OK**.
6. Select the **Object Selector** button; then select the *storage location objects* you want included in this list.
7. When you finish, select **OK**.

You can select multiple storage location objects in the Object Selector window. When you select multiple Storage Location objects, they appear in the Selected Objects list.

If the list already contains storage location objects and you want to add more, ensure that the original objects are still in the list before selecting **OK**.

You can remove existing storage locations by deleting their names from the list before selecting **OK**.

8. When you finish creating or modifying the list, select **OK**.

### ***Accessing NetStorage Files and Folders***

Based on how NetStorage has been configured, the NetStorage Web page displays the network files and folders you have access to.

Initially, you might only be able to see your iFolder directory and a local shared directory on the Linux server. Storage location objects are required for accessing files and directories on Linux servers and can also be used on NetWare servers.

For NetWare servers, NetStorage reads your NetWare login script to determine drive mappings, reads eDirectory User object properties to determine your home directory, and then displays a list of files and folders based on mapped drives and home directories.

If you usually log in to more than one eDirectory tree, you might have access to additional home directories in different eDirectory trees.

If you have a Novell iFolder account, the iFolder directory is also displayed. However, some NetStorage features, such as Download for Editing, are not available with Novell iFolder.

NetStorage reads the container, profile, and user login scripts only from the primary eDirectory server specified during the installation and displays the user's drive mappings only based on those login scripts.

Users might have specific eDirectory rights to certain files and folders on your network but will not be able to access those files and folders using NetStorage unless storage location objects have been created, login script drive mappings exist to those folders, or the files and folders are in the user's home directory.

If you want to provide users with NetStorage access to a specific folder, you might have to add a drive mapping command to that folder in a login script (container, profile, or user).

To access NetStorage from a workstation, do the following:

1. Start your browser and specify the following URL for NetStorage:

**`https://IP_or_DNS/NetStorage`**

The date and time on the workstation being used to access NetStorage should be reasonably close (within a few hours) to the date and time on the server running NetStorage to avoid conflicts.

2. Enter your *username* and *password*.

NetStorage uses your Novell eDirectory username and password, so you don't need to remember or use a separate username or password.

You can use many of the same conventions for expanding and contracting folders and opening files that are available in Windows Explorer.

To create new folders or copy, delete, rename, move, or download existing files using a browser, select options on the **File** menu.

Selecting the Folder View button in the browser window displays folders in another column and lets you expand and contract folders.

The Text View displays only the files and folders in the current directory and does not let you expand or contract folders.

Local files and folders are not accessible using NetStorage. Also, you cannot map drives or change login scripts from NetStorage.

3. When you finish, close the web browser.

## ***Configuring NetStorage***

Using Novell iManager, you can change your NetStorage configuration after it has been installed on a Linux server.



---

After changing any settings, you must restart the Apache web server.

To restart the Apache web server, change to the /etc/init.d directory and enter **./novell-httpd restart** to stop and start the web server.

---

To configure NetStorage, do the following:

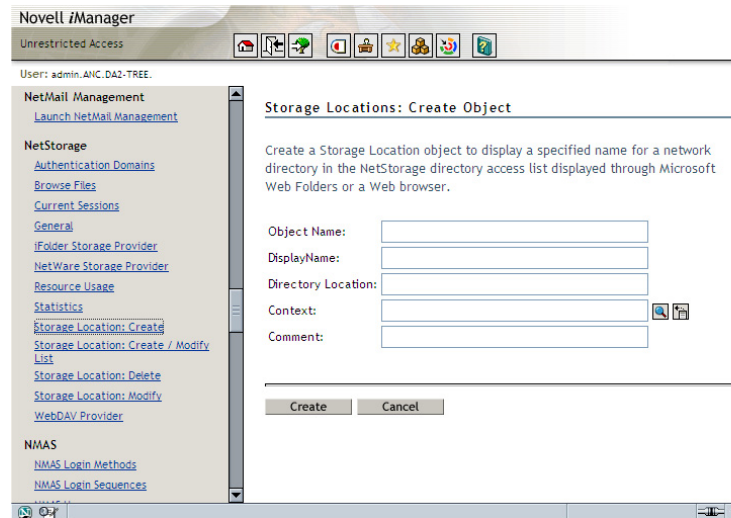
1. From a web browser, start and log in to iManager.

The date and time on the workstation being used to access NetStorage should be reasonably close (within a few hours) to the date and time on the server running NetStorage to avoid conflicts.

2. In the left column, locate the NetStorage configuration options you want to change.

The following illustrates these options:

**Figure 6-20**



The following configuration options are available:

- ❑ **Authentication Domains.** Lets you change or add the eDirectory server URLs and contexts that are required by NetStorage. This allows you to access two or more eDirectory trees.  
This page also lets you change the eDirectory server that is designated as the Primary.
- ❑ **Browse Files.** Displays the NetStorage web page.
- ❑ **Current Sessions.** Displays a report with information on the current NetStorage sessions.
- ❑ **General.** Lets you configure items such as location, certificate name, session timeout, janitorial level, and LDAP port.

- ❑ **iFolder Storage Provider.** If you have Novell iFolder installed on your Linux server, you can view or edit configuration settings such as root, passphrase form protocol, iFolder server, and secure port.
  - ❑ **NetWare Storage Provider.** Lets you view or edit configuration settings such as home name, drive name, and container search height.
  - ❑ **Resource Usage.** Displays a detailed report of resource utilization for NetStorage.
  - ❑ **Statistics.** Displays a report with information about server up time, login failures, number of NetStorage sessions, etc.
  - ❑ **Storage Location.** Lets you create a Storage Location object to display a specified name for a network directory in the NetStorage directory access list displayed through a web browser.
  - ❑ **WebDAV Provider Settings.** Lets you configure the location of the NetStorage WebDAV provider (Moniker) and the directory for the HTML interface.
3. When you finish, close the web browser.



For details on setting these configuration options and troubleshooting NetStorage, see the NetStorage Administration Guide at <http://www.novell.com/documentation>.

---



**25 minutes**

### ***Exercise 6-5    Configure and Test NetStorage***

As network administrator for your Digital Airlines office, you have been assigned to configure NetStorage services for the Efficiency Project team that has just been formed.

You have also been asked to create a personal folder for the team lead, SRife.

The Efficiency Project team is composed of the ACCTUSERS group.

You'll do this in 3 parts.

- Part I: Test the Default NetStorage Configuration
- Part II: Configure the Team Lead to Use a Personal Folder
- Part III: Create a Project Files Folder the Team Can Use to Share Files

#### **Part I: Test the Default NetStorage Configuration**

In this part of the exercise you will test the default NetStorage configuration by making no changes to the smb.conf file and not converting eDirectory users to LUM or Samba.

By doing this, you will see that the default configuration does not provide the NetStorage services you've been assigned to create.

To accomplish this, do the following:

1. Access the default **shared** folder and upload a file to it:
  - a. At the Windows XP workstation, launch **Internet Explorer**.
  - b. Enter **https://your\_server\_DNS/NetStorage**.
  - c. When prompted, authenticate as **kfullmer** with a password of **novell**; then select **OK**.
  - d. Expand the **NetStorage** folder.

- e. Select (highlight) the **shared** folder.
  - f. In the right pane, select **File > Upload**.
  - g. In the Upload File window, select **Browse**.
  - h. Browse to **C:\Documents and Settings\All Users\Shared Documents\Shared Pictures\Sample Pictures**.
  - i. Select **Blue hills**; then select **Open**.
  - j. From the Upload File window, select **Upload**.
2. Verify that the file was uploaded to the NNLS server:
    - a. At the NNLS server, open a *terminal session*.
    - b. Enter **su -**; then enter **novell** for the password.
    - c. Enter **cd /var/opt/novell/netstorage/shared**.
    - d. Enter **ls -l Blue\***.  
You should see the Blue hills.jpg file listed.
3. Create a personal storage location for the team lead from the team lead's home directory:
    - a. On your NNLS server, from iManager under **File Access (NetStorage)**, select **Storage Location: Create**.
    - b. In the Object Name field, enter **TeamLead**.
    - c. In the Display name field, enter **TeamLead**.
    - d. In the Directory Location field, enter **cifs://10.0.0.x/SRife**.
    - e. In the Context field, enter *your container*.
    - f. Select **Create**.
    - g. When prompted that the location was created, select **OK**.
4. Associate the new storage location with SRife by completing the following:
    - a. Select **Storage Location: Create / Modify List**.
    - b. In the Object field, browse to and select **SRife**.
    - c. Select **OK**.

- d. In the Storage Location Objects field, browse to and select **TeamLead.your container**; then select **OK**.
- e. When prompted that the assignment succeeded, select **OK**.
5. Verify that the **TeamLead** storage location object is available to **SRife** by logging in to NetStorage as **SRife**:
  - a. In Mozilla, select **File > New > Navigator Window** to open a new browser window.
  - b. Enter **https://your\_server\_DNS/NetStorage**.
  - c. When prompted, authenticate as **SRife** with a password of **novell**; then select **OK**.

You should see the TeamLead storage location displayed.
6. Attempt to view files in, and upload files to, the TeamLead folder:
  - a. Select the **TeamLead** folder.

The right pane will be blank if you have not converted SRife to a LUM and Samba user.
  - b. From the NetStorage menu, select **File > Upload**.

The Upload window will also be blank because SRife is not a LUM and Samba user.
  - c. Log out of NetStorage, by selecting **Logout**.

## Part II: Configure the Team Lead to Use a Personal Folder

In this part of the exercise you will configure SRife to use the personal folder you created for him. You will also verify that other users cannot see the TeamLead folder.

To accomplish this, do the following:

1. Using steps that you have already performed in previous exercises, convert **SRife** to LUM and Samba. Use the following information:

- ❑ Primary group: **ACCTUSERS**

- ❑ Samba password: **novell**

2. Log in as a LUM user to create SRife's *home directory*.

3. On your NNLS server, log into NetStorage as **SRife**.

4. View the files in SRife's TeamLead folder, by selecting **TeamLead**.

You should see the default files and folders created in SRife's home directory.

5. Upload a file to the TeamLead folder:

- a. Select **File > Upload**.

- b. From the Upload File window, select **Browse**.

- c. Browse to **/tmp**.

- d. Select *your container.ldif*; then select **Open**.

- e. From the Upload File window, select **Upload**.

The NetStorage screen refreshes and the *your container.ldif* file appears in the list of files in the TeamLead folder.

- f. Log out of NetStorage by selecting **Logout**.

6. Convert **JNelson**, who is already a LUM user, to a Samba user.

7. Log in to NetStorage as **JNelson** and attempt to view the TeamLead folder.

Although JNelson is a Samba user, she cannot see the TeamLead folder because she is not assigned to the TeamLead storage location object. She also does not have rights to SRife's home directory.

8. Log out as **JNelson**.

9. **Close** the browser window.

### Part III: Create a Project Files Folder the Team Can Use to Share Files

In this part of the exercise you will configure storage location objects to point to a public share that everyone in *your container* can use and to a private share that only the team can use to share files.

To accomplish this, do the following:

1. Create a Storage Location:
  - a. From iManager under **File Access (NetStorage)**, select **Storage Location: Create**.
  - b. In the Object Name field, enter **PublicShare**.
  - c. In the Display name field, enter **PublicShare**.
  - d. In the Directory Location field, enter **cifs://10.0.0.x/tmp**.  
The /tmp directory was configured as a public Samba share in a previous exercise.
  - e. In the Context field, enter *your container*.
  - f. Select **Create**.
  - g. When prompted that the location was created, select **OK**.
2. Associate the new storage location with the ACCTUSERS group by completing the following:
  - a. Select **Storage Location: Create / Modify List**.
  - b. In the Object field, browse to and select *your container*.
  - c. Select **OK**.
  - d. In the Storage Location Objects field, browse to and select **PublicShare.your container**; then select **OK**.
  - e. When prompted that the assignment succeeded, select **OK**.
3. Test the configuration by completing the following:
  - a. In Mozilla, select **File > New > Navigator Window** to open a new browser window.

- b. Enter **https://your\_server\_DNS/NetStorage**.
  - c. When prompted, authenticate as **kfullmer** with a password of **novell**; then select **OK**.  
  
You should see the PublicShare storage location displayed. You cannot see any files in the PublicShare folder because kfullmer has not been converted to a Samba user.
  - d. Select the **Logout** icon on the NetStorage menu bar.
4. Convert **kfullmer** to LUM and Samba and attempt again to log in as kfullmer and access the PublicShare folder; then **logout** and close the browser window.
5. Prepare a directory on your NNLS server where files for a project team can be saved by completing the following:
  - a. On your NNLS server, create a new directory in /var called ProjectFiles by entering **mkdir /var/ProjectFiles**.
  - b. Assign ACCTUSERS as Group for /var/ProjectFiles, by entering **chown root:ACCTUSERS /var/ProjectFiles**.  
  
ACCTUSERS is already a LUM group. If it has not been converted to LUM you will receive an error at this point.
  - c. Give Group rwx permissions to the directory and restrict root and Others from having permissions by entering **chmod 070 /var/ProjectFiles**.
6. Edit smb.conf to create a private Samba share that gives ACCTUSERS access, through Samba, to the ProjectFiles folder:
  - a. Select **Applications > KDE Menu > System > File Manager - Super User Mode**.
  - b. Enter a password of **novell**; then select **OK**.
  - c. Browse to **/etc/opt/novell/samba**.
  - d. Right-click the **smb.conf** file; then select **Open With > KWrite**.

- e. Scroll down to the **Share Definitions** section and add the following:

```
[ProjectFiles]
  path = /var/ProjectFiles
  writable = yes
  public = no
  group = ACCTUSERS
```
- f. Select **File > Save**; then select **File > Quit**.
7. Restart the Samba service by entering

```
/etc/init.d/novell-smb stop
/etc/init.d/novell-smb start.
```
8. Create a Storage Location:
  - a. From iManager under **File Access (NetStorage)**, select **Storage Location: Create**.
  - b. In the Object Name field, enter **ProjectFiles**.
  - c. In the Display name field, enter **ProjectFiles**.
  - d. In the Directory Location field, enter **cifs://10.0.0.x/ProjectFiles**.
  - e. In the Context field, enter *your container*.
  - f. Select **Create**.
  - g. When prompted that the location was created, select **OK**.
9. Associate the new storage location with the ACCTUSERS group by completing the following:
  - a. Select **Storage Location: Create / Modify List**.
  - b. In the Object field, browse to and select **ACCTUSERS.your container**.
  - c. Select **OK**.
  - d. In the Storage Location Objects field, browse to and select **ProjectFiles.your container**; then select **OK**.
  - e. When prompted that the assignment succeeded, select **OK**.

**10.** Test the configuration by completing the following:

- a. In Mozilla, select **File > New > Navigator Window** to open a new browser window.
- b. Enter **https://your\_server\_DNS/NetStorage**.
- c. When prompted, authenticate as **JGoldman** (or some other ACCTUSERS group member) with a password of **novell**; then select **OK**.

You should see the ProjectFiles storage location displayed.

You should also be able to upload files to the ProjectFiles folder. If you cannot, make sure that JGoldman is Samba enabled, then try again.

- d. Select the **Logout** icon on the NetStorage menu bar; then close the browser window.
- e. (Optional) Explore and see who can access the ProjectFiles folder and who can't.

*(End of Exercise)*



## Summary

Objective	Summary
<b>1. Describe the Purpose and Architecture of iFolder</b>	<p>Novell iFolder is a Net services software solution that lets mobile professionals access their local files from anywhere—online, offline, all the time—across multiple workstations and the Net.</p> <p>iFolder automatically and intelligently updates your files across desktop computers, laptops, and other connected devices you use, letting you use them wherever you happen to be—at the office, at home, or in a hotel.</p> <p>All you need is an active network or Internet connection and the iFolder client, a Web browser, or NetDrive.</p> <p>To describe the purpose and architecture of iFolder, you need to know the following:</p> <ul style="list-style-type: none"><li>■ iFolder Benefits</li><li>■ iFolder Features</li><li>■ iFolder Components</li><li>■ iFolder Architecture</li></ul>

---

Objective	Summary
<b>2. Install and Configure iFolder</b>	<p>You install and configure iFolder on Linux in 4 basic stages:</p> <ol style="list-style-type: none"><li>1. Install the first iFolder server.</li><li>2. Configure Global settings, default policies, LDAP authentication sources, and iFolder servers.</li><li>3. Provision iFolder users.</li><li>4. Install additional iFolder servers (as needed).</li></ol> <p>To complete these phases and manage iFolder, you need to know the following:</p> <ul style="list-style-type: none"><li>■ Prerequisites for Installing on Linux Servers</li><li>■ How to Install iFolder from NNLS</li><li>■ How to Configure Your iFolder Server</li><li>■ How to Access the iFolder Web Sites</li><li>■ How to Install and Configure the iFolder Client</li><li>■ How to Manage iFolder User Accounts</li><li>■ How to Manage iFolder Servers</li><li>■ How to Manage LDAP Servers</li><li>■ How to Monitor Your iFolder System</li><li>■ How to Generate Reports</li></ul>

---

Objective	Summary
<b>3. Describe the Purpose and Architecture of Samba</b>	<p>Samba is a software package that implements Microsoft's SMB/CIFS networking protocols on Linux.</p> <p>It allows a Linux machine to function as a Windows-compatible file server and to act as a client to other Windows servers.</p> <p>To describe the purpose and architecture of Samba, you need to know the following:</p> <ul style="list-style-type: none"><li>■ What Server Message Block (SMB) Is</li><li>■ What Common Internet File System (CIFS) Is</li><li>■ Samba and NNLS</li></ul>
<b>4. Install and Configure Samba</b>	<p>To install and configure Samba, you need to know the following:</p> <ul style="list-style-type: none"><li>■ Steps for Installing Samba</li><li>■ How to Configure Samba</li><li>■ How to Access Files Through Samba</li></ul>

Objective	Summary
<b>5. Describe the Role and Function of NetStorage</b>	<p>NetStorage provides secure Internet-based access to files and folders on Linux, Windows, and NetWare servers in your network through a browser.</p> <p>NetStorage authentication relies on Novell eDirectory authentication to provide secure access, so Internet-based access is as secure as accessing files from within the network.</p> <p>To describe the role and function of NetStorage, you need to understand the following:</p> <ul style="list-style-type: none"><li>■ NetStorage Benefits</li><li>■ How NetStorage Works</li><li>■ What Users See When They Access NetStorage</li></ul>
<b>6. Install and Configure NetStorage</b>	<p>To install and configure NetStorage, you need to know the following:</p> <ul style="list-style-type: none"><li>■ Steps for Installing NetStorage</li><li>■ Creating Storage Location Objects and Lists</li><li>■ Configuring NetStorage</li><li>■ Accessing NetStorage Files and Folders</li></ul>

## SECTION 7    Manage Printers with NNLS

In this section, you learn how to set up and configure iPrint on a Linux® server and how to print from a Windows® workstation.

### Objectives

1. Identify the Benefits of iPrint
2. Describe How iPrint Works
3. Install and Configure iPrint
4. Print with iPrint

### Introduction

Novell iPrint is a printing solution based on the industry standard Internet Printing Protocol (IPP), which eliminates the complexities of printing over the Internet.

iPrint lets employees, mobile employees, business partners, and customers access printers from a variety of remote locations using existing Internet connections.

Whether users are working in an office building, telecommuting from home, or attending a sales meeting in another country, iPrint ensures that they can print documents quickly, easily, and reliably.



---

For additional details on installing and configuring iPrint, see the *Novell iPrint Administration Guide* for Novell® Nterprise™ Linux® Services.

---

## Objective 1      Identify the Benefits of iPrint

The following are the benefits and features of iPrint:

- **Global access to printers.** iPrint allows mobile employees, business partners, and customers to access your printers from anywhere with a web browser.

For example, suppose you are attending a sales meeting at your company's regional office and you discover that you did not bring enough copies of the monthly sales report.

Using your laptop and a web browser, you can browse to a floor plan of the building, select the printer next to the conference room, and print additional copies of the sales report.

- **Reduced communication costs.** Printing to a remote location can be challenging. Faxing can be expensive and inefficient.

If you email a document, you have to be sure the recipient has a compatible word processing or page-layout application.

By contrast, iPrint enables you to use existing printers to print high-quality, legible documents.

- **Secure printing.** eDirectory integrates with iPrint to ensure that only authorized users can access your printers.

Print jobs are submitted to the iPrint Manager via SSL to prevent unauthorized users from accessing your documents.

- **Unified management.** You can control all your printers from a single location, even if the printers are made by different manufacturers and are in different locations.

You can even use customized management features to create a common interface to access your company's print resources.

- **Customized viewing of printers.** Users can immediately view available printers from a web page. Network administrators can customize this page to meet specific business requirements.

For example, using the Map Design tool, you can insert a floor plan of your building into a corporate web page.

You can then easily drag and drop icons to the floor plan that represent the actual locations of your printers.

You can access the map through a browser and select a printer icon to install the printer and its drivers.

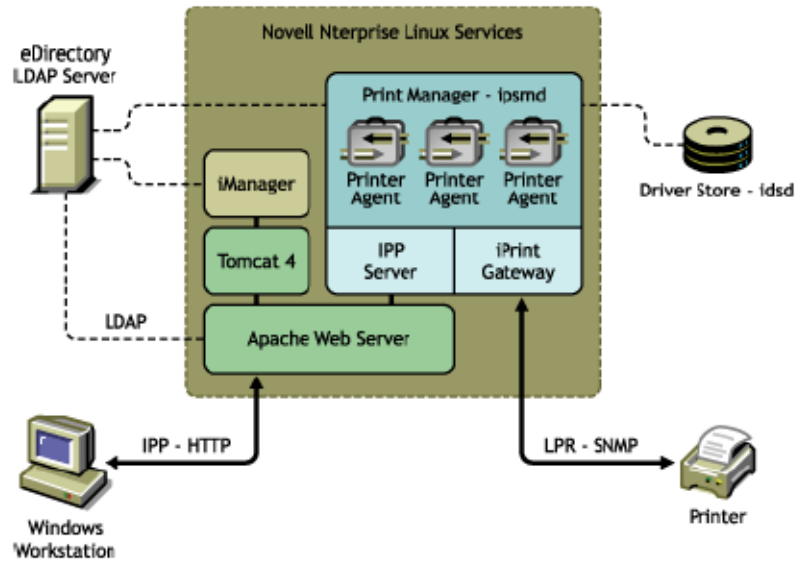
## **Objective 2      Describe How iPrint Works**

To describe how iPrint works, you need to know how the following components work:

- iPrint Manager
- iPrint Driver Store
- iPrint Client
- iPrint Map Designer

The following illustrates how the iPrint Manager, iPrint Driver Store, and iPrint client components provide print services:

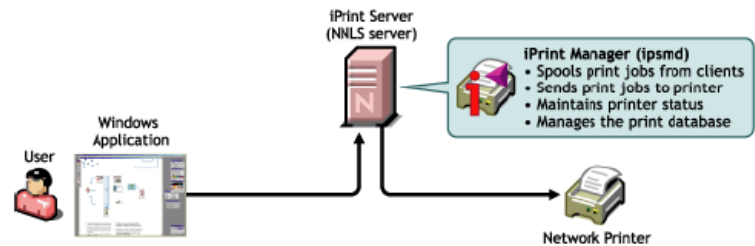
Figure 7-1



### *iPrint Manager*

The iPrint Manager is an object in the eDirectory™ tree as well as a daemon that runs on your Linux server. Print jobs are submitted to the iPrint Manager and then forwarded to the printer, when the printer is ready:

Figure 7-2





A single iPrint Manager can handle print jobs for multiple printers.

Depending on your network configuration—for example, remote location—you can create additional iPrint Managers on other servers, but only one iPrint Manager can exist on the same server.

To understand how the iPrint Manager works, you need to know the following:

- What the Printer Agent Is
- What the IPP Server Is

### **What the Printer Agent Is**

The Printer Agent is an entry in the iPrint Manager database that represents the printer. The Printer Agent is automatically created in the database when you create a Printer object in eDirectory.

The Printer Agent manages the processing of print jobs, answers queries from network clients about a print job or attributes of a printer, and generates event notification so that interested parties can be notified of printing problems and errors or changes in the status of a print job, document, or printer.

### **What the IPP Server Is**

iPrint uses IPP, an industry standard HTTP-based printing protocol that runs over TCP/IP networks.

IPP provides the following benefits:

- A simple printing protocol
- Broad vendor support
- Functionality over local networks and the Internet
- Print data encryption (SSL, TLS)
- Standard print protocol for all platforms (such as Windows, Macintosh®, UNIX®, and Linux)

The IPP server's main function in iPrint is to handle IPP and IPPS requests from the Web server and deliver the requests to the iPrint Manager or to the iPrint Driver Store.

### ***iPrint Driver Store***

The iPrint Driver Store is a repository of printer drivers for your print system. When the first user of a printer installs that printer, the iPrint Manager requests the associated printer driver from the iPrint Driver Store and caches the printer driver for future uses.

Periodically, iPrint Managers refresh their cached copies of printer drivers with updated printer drivers from their associated driver store.

The iPrint Driver Store is an eDirectory object. Only one iPrint Driver Store is required on a network but, depending on your network configuration, you can create additional iPrint Driver Stores.

The fewer Driver Stores running the better, because you will not have to track which driver store has which printer drivers.

### ***iPrint Client***

The iPrint client is a set of DLLs with a small browser plug-in that lets you install printers and download the corresponding print drivers to your Windows workstation using your Web browser.

When a user selects the printer icon to install a printer, iPrint checks to see if the iPrint client is installed on the workstation. If the iPrint client is not installed, the user is prompted to install it.



---

There is no Linux version of the iPrint client in NNLS 1.0. The iPrint client for this version is Windows only.

---

The iPrint client includes the following components:

- Print Provider
- Browser Plug-In
- Client Configuration Options
- Command Line Utilities

### **Print Provider**

The iPrint print provider communicates directly with the Windows Spooler, which takes print jobs from applications and delivers them to a print provider.

At startup, the iPrint client makes sure that the iPrint print provider is the first one in the list of providers. When a print job is destined for an iPrint printer, the iPrint print provider delivers the print job to the iPrint Manager.

## Browser Plug-In

The iPrint client contains a browser plug-in for Internet Explorer. This OCX-based plug-in lets you install printers through your Web browser.

## Client Configuration Options

Through the iPrint client configuration screen, you can take advantage of several advanced client features, including the following:

- Proxy server
- Novell iCapture LPT Port Redirector Utility
- Terminal server setup
- Password management

## Command Line Utilities

The iPrint MS-DOS® commands let you install iPrint printers without a Web browser and capture LPT ports to iPrint printers.

These commands are useful when you have legacy applications that require output to an LPT port, or when you want to add printers through a login script.



---

For additional details, see “Implementing iPrint Using MS-DOS Commands” in the *Novell iPrint Administration Guide for Novell Nterprise Linux Services*.

---

### ***iPrint Map Designer***

The iPrint Map Designer is a utility that allows you to create maps of printer locations by using drag-and-drop technology. After the maps are created, they can be posted on a Web server for users to access.

The map designer can only be accessed from a Windows computer that has the iPrint client installed on it.

## **Objective 3    Install and Configure iPrint**

To install and configure iPrint, you need to know how to do the following:

- Install iPrint on a Linux Server
- Install the iPrint Client on a Windows Workstation
- Create and Start a Driver Store
- Add Printer Drivers to Your Driver Store
- Create and Start the iPrint Manager
- Create Your Printer Objects
- Configure Your Network for Workstation and/or User Printers
- Create Location-Based Printing Web Pages



iPrint runs on Apache 2. By default, Apache has Access Logging turned on, which will log all printing-related access information. The Access Logging log files are stored in **var/opt/novell/httpd/logs**.

These log files might cause you to run out of disk space and, in turn, cause printing to stop. To avoid running out of disk space, periodically remove old log files, specify a different disk for the log file, or disable Access Logging.

For more information, see the log directives on the Apache Web site at <http://httpd.apache.org/docs/logs.html>.

---

### ***Install iPrint on a Linux Server***

To install iPrint on your Linux server, you need to know how to

- Meet iPrint Dependencies
- Gather Required Information
- Use the NNLS Install Feature
- Locate iPrint Files

### **Meet iPrint Dependencies**

iPrint is dependent on the following NNLS components being installed on the same server:

- Apache 2.0.45
- JVM™
- Tomcat 4
- iManager 2.0.2
- eDirectory 8.7.3 (anywhere on the network)

If these components are not already installed, you have to install them when installing iPrint.

The NNLS install program will select the required components, along with their dependencies, when you select the iPrint component. They will all be installed in the same process.

See Table 2-4 for information needed to successfully install any iPrint dependencies that are not already installed.

### Gather Required Information

The following table describes the information needed to successfully install iPrint:

**Table 7-1**

Configuration Data Required	Description
Admin Name with Context	The fully distinguished name of the Admin for the eDirectory server specified for iManager.  The name and context must be specified using typeful syntax (cn= <i>name</i> .ou= <i>organizational-unit</i> .o= <i>organization</i> ).
Admin Password	The password for the Admin.
iPrint Server IP Address or Hostname	The IP address or DNS hostname of the eDirectory server on which iPrint is installed and the schema is extended.  The server must have a master or read/write replica of eDirectory installed.

### Use the NNLS Install Feature

To install iPrint from NNLS, do the following:

1. Perform the steps to do a custom installation.



---

If necessary, see Section 2 for details on how to perform a custom installation.

---

2. Deselect the services you *do not want* to install, select the iPrint service, and then continue.

If eDirectory has not been installed previously, notice that it is selected by default when you select iPrint (along with other required components such as Apache and Tomcat).

If eDirectory has been previously installed, the install program will indicate which components are already installed.

3. Accept the license agreement.
4. (Conditional) If prompted for the location of the NICI Foundation Key (NFK) file, enter the path to the NFK file.

You will only be asked for the NICI Foundation Key if eDirectory has not been installed previously.

5. Enter the information requested at each prompt (see Table 7-1).
6. View the summary information and make any necessary corrections.
7. When all the information is correct, finish the installation.
8. View the readme file and save the installation settings log file.



---

Before you can uninstall iPrint, you need to stop the following processes on the server by entering the following commands:

```
/etc/init.d/novell-idsd stop  
/etc/init.d/novell-ipsmd stop
```

You can then run the uninstall procedure as described in Section 2.

---



### Locate iPrint Files

During a default installation, the following iPrint directories and files are created:

- `/var/opt/novell/httpd/htdocs/ippdocs`
- `/var/opt/novell/iprint`
- `/var/opt/novell/log/ipsmd.log`
- `/etc/opt/novell/iprint/ipsmd.conf`

The **`/var/opt/novell/httpd/htdocs/ippdocs`** directory holds items such as the list of available print drivers (`iprint.ini`) and printer maps.

The **`ipsmd.log`** and **`ipsmd.conf`** files are the log and configuration files for the iPrint daemon (`ipsmd`).

### *Install the iPrint Client on a Windows Workstation*

To install the iPrint client on a Windows workstation, do the following:

1. Enter the following URL in Internet Explorer:  
**`http://server_ip_address/ipp`**
2. Select **Install iPrint Client**.
3. Follow the steps to install the client.
4. Restart your Windows workstation.

### ***Create and Start a Driver Store***

To create and start a driver store, do the following:

1. Open iManager:
  - a. For the iManager URL, enter  
**https://server\_ip\_address/nps/iManager.html**  
A Login page appears.
  - b. Enter your username and password.
  - c. Select **Login**.  
After a few moments, the Novell iManager home page appears.
2. On the left under iPrint, select **Create Driver Store**.
3. Enter a driver store name.
4. Enter, or browse to and select, a container for the driver store.
5. In the Target Server field, enter a DNS name or IP address for the server that will host the driver store.
6. In the eDir Server field, enter the context of your eDir server.
7. Make sure **Start Driver Store after Creation** is selected.
8. Select **OK**.

### ***Add Printer Drivers to Your Driver Store***

iPrint allows you to upload drivers to your Driver Store by using the drivers from an .inf file or from the drivers that currently exist on your Windows workstation.

To add drivers to your driver store, do the following:

1. In iManager under iPrint, select **Manage Driver Store**.
2. Browse to and select the driver store you want to add print drivers to.

3. Select **OK**.
4. Select the **Drivers** tab.
5. Select the tab of the Platform you want to work with (**XP**, **2000**, **NT 4**, or **95/98/Me**).
6. Do one of the following:
  - ❑ Add drivers from a print driver .inf file by selecting **Add from File**.
  - or*
  - ❑ Add drivers from the Windows workstation client on which you are running iManager by selecting **Add from System**.



---

If you choose **Add from System**, you can only upload drivers to the same platform as the workstation you are working from.

For example, if you are on a Windows 2000 machine, you will only be able to upload the drivers that are on your Windows 2000 machine.

---

7. Select the printer driver you want to add.
8. Select the Printer Driver Language (PDL) for the driver.
9. Select **OK**.
10. Repeat steps 7 through 9 until you have added all of your printer drivers.
11. Select **OK**.

### ***Create and Start the iPrint Manager***

To create and start the iPrint Manager, do the following:

1. In iManager under iPrint, select **Create Print Manager**.
2. Enter a Manager name.

3. Enter the **container** where you want the iPrint Manager's object to reside.
4. In the Target Server field, enter a **DNS name** or **IP address** for the server that will host the iPrint Manager.
5. In the eDir Server field, enter the **context** of your eDirectory server.
6. In the Driver Store field, browse to and select your Driver Store object.
7. Make sure **Start print manager after creation** is selected.
8. Select **OK**.

### **Create Your Printer Objects**

To create a printer object for your printer, do the following:

1. In iManager under iPrint, select **Create Printer**.
2. Enter the name you want to assign to the new printer.



---

No spaces are allowed in print object names. Use an underscore (\_) instead.

---

3. In the Container name field, browse to and select the **container** where you want the printer to reside.
4. In the Manager name field, browse to and select the iPrint Manager you want to have assigned to this printer.
5. In the DNS name or IP address field, enter the **DNS name** or **IP address** of the printer.

Secure printing uses port 443 to send secure data from the client to the server.

Non-secure printing uses port 631 to send clear text from the client to the server.



All print data is non-secure between the server and the printer because iPrint sends its data from the server to the printer via LPR (Line Printer Remote). LPR does not handle authentication or security and, therefore, is clear text.

---

6. (Optional) Enter information describing the location of the printer.
7. (Optional) Enter a description of the printer.
8. Select **Next**.
9. Select the default print drivers to install for each Windows platform.
10. Select **Next**.
11. (Optional) To create additional Printer objects, select **Repeat Task** and repeat all the above steps to create a Printer object.
12. Select **OK**.

### ***Configure Your Network for Workstation and/or User Printers***

Before you configure your network for workstation and/or user printers, you need to understand what each of them is:

- **Workstation Printer.** This is an installed printer on a Windows NT/2000/XP machine that is available to anyone who is logged on to that Windows machine.

Workstation printers can be created on Windows NT/2000/XP machines only by users who have Administrator or Power User rights.

- **User Printer.** This is an installed printer that is available only to the person who installed it on a Windows NT/2000/XP machine.

User printers can be created by any user in your network.

To determine which kinds of printers are created on your network, do the following:

1. Browse to the `iprint.ini` file located in the `/var/opt/novell/httpd/htdocs/ippdocs` folder on your Linux server.
2. Right-click the `iprint.ini` file; then select **Open With > gedit**.
3. Configure the **AllowUserPrinters** value to one of the following:
  - ❑ **0** (the default) means that only users with sufficient rights (Administrator rights or Power User rights) can install a printer to the desktop. When a printer is installed to the desktop, it will be a Workstation printer.
  - ❑ **1** means that if the current user doesn't have rights to add it as a Workstation printer, it will be added as a User printer.
  - ❑ **2** means that all printers added, regardless of the user's rights, will be User printers.



---

Windows 9x ignores these values and only creates Workstation printers.

---

4. When you finish, select **Save**.
5. Select **Exit**.

### ***Create Location-Based Printing Web Pages***

Location-based printing lets users select printers based on location by using one of the following:

- List View
- Maps

## List View

The iPrint Manager creates a list of your printers at the default iPrint page ([http://server\\_IP\\_address/ipp](http://server_IP_address/ipp)).

To create a custom web page with your own list, you must use an HTML editor and create links to the printer's URL.

To view a printer's URL, do the following:

1. In iManager under iPrint, select **Manage Printer**.
2. In the **iPrint Printer name** field, browse to and select the printer you want.
3. Select **OK**.
4. Select **Client Support > iPrint Support**.

The printer's URL is displayed under Accepted IPP URL.

## Maps

You can create maps with printer icons representing the location of your printers within your workplace environment. This enables your users to easily select which printer they want to print from, and download the correct driver for that printer.

Novell has created an iPrint Map Designer tool that utilizes drag-and-drop technology to aid you in creating your own location-based maps.

To create and configure a location-based map using the iPrint Map Designer, you must have the following:

- Internet Explorer 5.5 or later
- Windows 95/98/Me or Windows NT/2000/XP
- iPrint client installed on the workstation
- Maps to place printers in

You can create your own maps using any graphic tool (supported formats are GIF, JPG, and BMP). Two sample maps can be found on the iPrint server in the `/var/opt/novell/httpd/htdocs/ippdocs/images/maps` folder.

To configure a map to support location-based printing, do the following:

The folder listed in step 1 contains 2 sample maps for your use.

1. Copy all your *background images* (maps) to the `/var/opt/novell/httpd/htdocs/ippdocs/images/maps` directory on your Linux server.

File types that can be used for background images are JPG, GIF, and BMP.

2. In a web browser on your Windows workstation, open **`http://server_IP_address/ippdocs/maptool.htm`**.

The iPrint Map Designer tool home page appears.

3. At the bottom of the left frame, select a **Background** image.

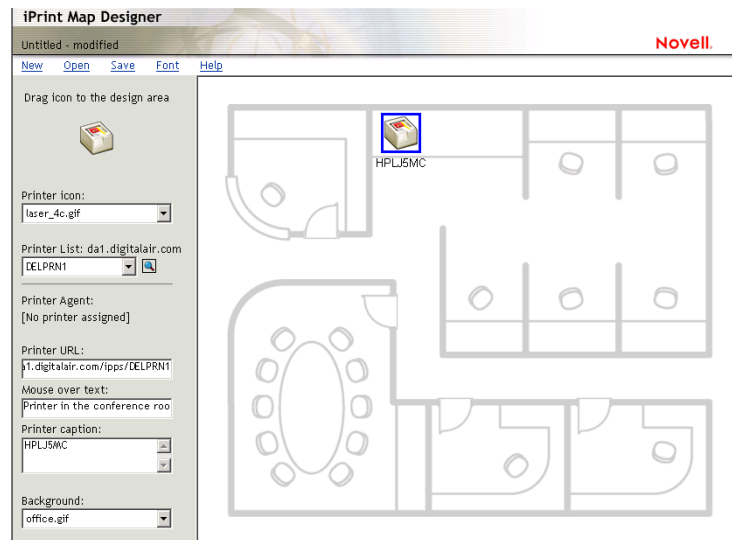
The drop-down box displays the list of images stored in the `/var/opt/novell/httpd/htdocs/ippdocs/images/maps` folder on your Linux iPrint server.

4. In the Printer icon field, select a *printer icon* that best represents your printer.
5. Drag the *printer icon* to the correct area on the displayed map.



A *printer icon* similar to the following, appears on the map:

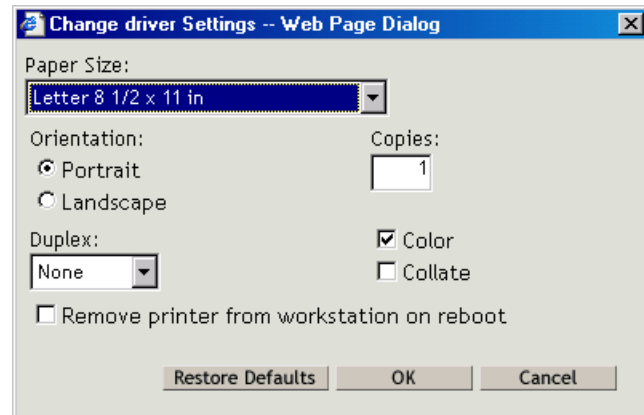
Figure 7-3



6. Select the *printer icon* that you just placed on your map.
7. From the **Printer List** drop-down list, select the printer you want to associate to this printer icon.
8. Enter the *mouse-over text*.  
This is the text you want to be displayed when you move the mouse over the printer name.
9. Enter the *printer caption*.  
This is the text to be displayed below the printer icon in the graphic.
10. From the top frame, select **Driver settings**.

The change Driver settings -- Web Page dialog appears:

Figure 7-4



This dialog box allows you to pre-set some of the driver defaults. You can set configurations such as the paper size, orientation, and number of copies made.

You can also select the **Remove printer from workstation on reboot** option. This option is useful for printers that are used mostly by travelling employees who do not want an overabundance of printers in their printer folder.

11. Select your default driver settings; then select **OK**.
12. From the top frame, select **Save** and save the file with an HTM extension to the **tmp** directory (or somewhere readily accessible) on your Windows workstation.

To give your users access this map, you will have to transfer this file to the **/var/opt/novell/httpd/htdocs/ippdocs** directory on your Linux server.

- 13.** To save this file to the **/var/opt/novell/httpd/htdocs/ippdocs** directory on your Linux server, do the following:
- a. Share your **tmp** folder (or wherever it is that you saved your map file to) on your Windows workstation.
    - a. Open Windows Explorer.
    - b. Browse to and right click the **tmp** directory.
    - c. Select the **Sharing** tab.
    - d. Select **If you understand the security risks but want to share files without running the wizard, click here.**
    - e. Select **Just enable file sharing.**
    - f. Select **OK.**
    - g. Select **Share this folder on the network.**
    - h. Select **OK.**
  - b. On your Linux server, log in as root.
    - a. Select the Gnome footprint.
    - b. Select **Log out.**
    - c. Select **Yes.**
    - d. Enter **root** at the Login screen.
    - e. Enter your password.
  - c. On your Linux server, open the Nautilus window by double-clicking the **Start Here** icon on the desktop.
  - d. In the Location field of the Nautilus window, enter **smb:///**.  
Wait a moment for any shared servers on the network to appear.
  - e. Open **Workgroup.**
  - f. Open **your workstation.**
  - g. Open the **tmp** folder (or other folder that you saved your map file to) of your Windows workstation.
  - h. Right-click your map and select **Copy File.**
  - i. Select the **Tree** tab in the left frame of your Nautilus window.

j. Browse to the `/var/opt/novell/httpd/htdocs/ippdocs` directory.

k. Right-click the right frame and select **Paste Files**.

The iPrint map is ready to be used for installing printers on the network.

## Objective 4    **Print with iPrint**

To print with iPrint, you must be on a Windows workstation, and you must install the iPrint Client and the correct printer driver for each printer you want to use.

When you select a printer that you want to print to (either from a default list or from a map that you created), iPrint checks to see if the iPrint client software is installed on your desktop and installs it for you, if necessary. The printer driver is then downloaded and the printer is installed in your Printer folder.

You can install printers in 2 ways:

- Use Printer Lists
- Use Maps for Location-Based Printing

### ***Use Printer Lists***

You can use your own custom-made printer lists or the default printer list generated by iPrint.

To install and use printers using the default printer list generated by iPrint, do the following:

1. From a web browser, enter **`http://server_IP_address/ipp`**.

The iPrint default page with a list of available printers appears.

2. Select the printer of your choice.
3. Confirm the installation by selecting **OK**.

The Install iPrint printer appears, showing the installation status and progress.

4. In the Novell iPrint Confirmation dialog, select **OK**.

The printer is installed and ready to use.

### ***Use Maps for Location-Based Printing***

To use the maps you created for your iPrint printers, do the following:

1. Browse to the following URL:

***http://server\_IP\_address/ippdocs/<the HTM map file you created>***

Suggest that students set up a DNS record to provide easier access to the maps created for the iPrint printers. For example, if the DNS name for printing is printing.mycompany.com, then the user would access iPrint from the following URL:

**http://printing.mycompany.com/ipp**



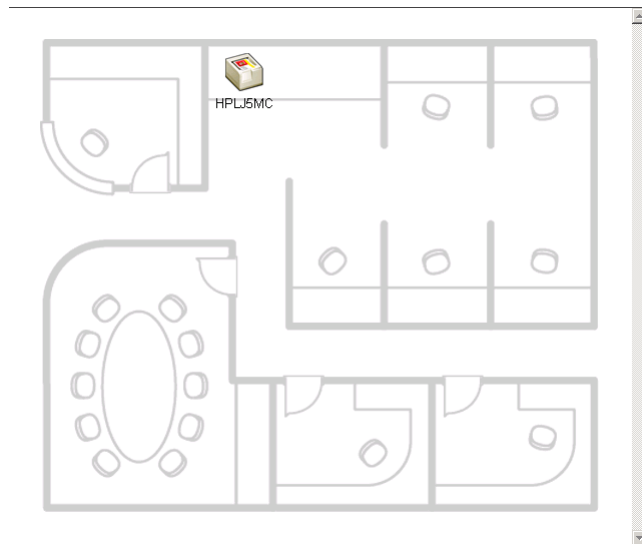
---

You can host your maps on your own Web server by copying the contents of the /var/opt/novell/httpd/htdocs/ippdocs directory and its subdirectories to your web server. You can link to your maps from your company's internal Web page or send the URL out to your users.

---

A map with your printer icon(s) similar to the following appears:

**Figure 7-5**



2. From the displayed map, select the printer of your choice.
3. Confirm that you want to install the printer.

The Install iPrint printer dialog appears, showing the installation status and progress.

4. In the Novell iPrint Confirmation dialog, select **OK**.

The printer is installed and ready to use.

**35 minutes****Exercise 7-1    *Install and Configure iPrint***

In this exercise you enable printing from Windows workstations at your Digital Airlines office by installing and configuring iPrint.



---

The entire exercise needs to be done from Internet Explorer. In a classroom setting, you'll need to work with your partner to share time on the Windows XP workstation.

---

Before starting the exercise, make sure students understand that they need to use Internet Explorer exclusively (no Mozilla).

Do the following:

- Part I: Install the iPrint Client on Your Windows Workstation
- Part II: Create and Start a Driver Store
- Part III: Add a Driver to Your Driver Store
- Part IV: Create and Start an iPrint Manager
- Part V: Create a Printer Object
- Part VI: Configure Your Network for Workstation and User Printers
- Part VII: Test the Basic iPrint Configuration
- Part VIII: (Optional) Configure a Map to Support and Test Location-Based Printing

## Part I: Install the iPrint Client on Your Windows Workstation

Before configuring iPrint on your NNLS server, the iPrint client needs to be installed on the Windows XP workstation (shared by 2 students).

One student (of the 2 sharing the workstation) needs to do the following:

1. From your Windows XP workstation, start Internet Explorer and enter the following URL:

**[http://DAX.your\\_container.digitalairlines.com/ipp](http://DAX.your_container.digitalairlines.com/ipp)**

An iPrint page appears. After a few moments, a message appears indicating that you must install the iPrint client before proceeding.

2. Continue by selecting **OK**.



---

If you do not see the message prompting you to install the iPrint client, on the iPrint page select **Install iPrint Client**.

---

3. Select **Open**.
4. Start the installation by selecting **Next**.
5. When the iPrint installation ends, select **Finish**.
6. Restart your computer.
7. When the computer restarts, log in as **Administrator**.

You need to be logged in as Administrator for the rest of the exercise to work properly.



## Part II: Create and Start a Driver Store

Do the following:

1. From your Windows XP workstation, access iManager by entering the following:  
  
***https://DAX.your  
container.digitalairlines.com/nps/iManager.html***
2. Log in as **admin** with a password of **novell**.
3. On the left expand **iPrint**; then select **Create Driver Store**.  
A Create Driver Store page appears.
4. Enter the following:
  - Driver Store name: **DAXDS1**
  - Container name: ***your container***
  - Target Server: ***DNS name*** or ***10.0.0.x***
  - eDir Server: ***DAX.your container***
5. When you finish, select **OK**.  
A success message appears.
6. Select **OK**.

## Part III: Add a Driver to Your Driver Store

Do the following:

1. From iManager under iPrint, select **Manage Driver Store**.
2. In the iPrint Driver Store name field, browse to and select ***DAXDS1.your container***.
3. Select **OK**.
4. Select the **Drivers** tab.
5. Select **Windows XP Drivers**.

6. Select **Add from System**.
7. Select the correct driver for your printer.
8. Select the correct PDL for your printer.
9. Select **OK**.

After a few moments, the printer driver appears in the Current drivers list.

10. Select **OK**.

#### **Part IV: Create and Start an iPrint Manager**

Do the following:

1. From iManager on the left under **iPrint**, select **Create Print Manager**.

A Create Manager page appears.

2. Enter the following:
  - ❑ Manager name: **DAxMGR1**
  - ❑ Container name: *your container*
  - ❑ Target Server: **DNS name** or **10.0.0.x**
  - ❑ eDir Server: **DAx.your container**
  - ❑ Driver Store: **DAxDS1.your container**.
3. Make sure **Start print manager after creation** is selected.
4. When you finish, select **OK**.

A success message appears.
5. Select **OK**.

## Part V: Create a Printer Object

Do the following:

1. From iManager on the left under **iPrint**, select **Create Printer**.  
A Create Printer page appears.
2. Enter the following:
  - Printer name: **DAXPRN1**
  - Container name: *your container*
  - Manager name: **DAXMGR1,your container**
  - DNS name or IP address: **10.0.0.101**
  - Location: **Outside Conference Room 112**
  - Description: **Office printer**
3. When you finish, select **Next**.
4. From the **Windows XP drivers** drop-down list, select the printer driver you installed.
5. Select **Next**.
6. Select **OK**.

## Part VI: Configure Your Network for Workstation and User Printers

Do the following:

1. From your NNLS server desktop, select **Applications > KDE Menu > System > File Manager - Super User Mode**.
2. Enter a password of **novell**; then select **OK**.
3. Browse to **/var/opt/novell/httpd/htdocs/ippdocs**.
4. Right-click the **iprint.ini** file; then select **Open With > KWrite**.
5. Change the **AllowUserPrinters** value to **1**.

6. Select **File > Save**; then select **File > Quit**.

## Part VII: Test the Basic iPrint Configuration

Do the following:

1. From your Windows XP workstation, start Internet Explorer and enter the following URL:

**`http://DAx.your_container.digitalairlines.com/ipp`**

The iPrint page appears, with a list of any printers that you have created.

2. Select **DAxPRN1**.
3. When asked if you want to install the following printer, select **OK**.
4. When informed that the printer has been successfully installed, select **OK**.
5. Verify that the printer shows up in your installed printers list:
  - a. Select **Start > Printers and Faxes**.
  - b. Right-click the **DAxPRN1** printer icon; then select **Properties**.
  - c. Select the **Ports** tab and note that, for this printer, the Port is the URL for this printer.
  - d. Select the **General** tab; then select **Print Test Page**.
  - e. After your test page prints, select **OK**.
  - f. Select **Cancel**.
  - g. Close the **Printers and Faxes** window.

## Part VIII: (Optional) Configure a Map to Support and Test Location-Based Printing

To configure a map to support location-based printing, do the following:

1. From Internet Explorer on your Windows XP workstation, enter the following URL:

**`http://DAX.your  
container.digitalairlines.com/ippdocs/maptool.htm`**

An iPrint Map Designer page appears.

---

If the page appears without any graphics displayed (such as a blank area to the right instead of a map design), the rest of this optional exercise will not work.

---

2. In iPrint Map Designer on the left (bottom), select a **Background** image.
3. From the Printer icon drop-down list, select a *printer icon* that best represents your printer.

The printer icon displayed above the list changes as you select a new icon name from the list.

4. Click and drag the **icon** to a location on the displayed map.
5. Select the *printer* icon that you just placed on your map.
6. From the Printer List drop-down list, select **DAXPRN1**.
7. At the top of the iPrint Map Designer page, select **Save**.

A Save As dialog appears.

8. Name the file **MapDAX.htm** (where *x* is your server number) and save the file to **tmp** on **'Samba Server'** (which is the Z: drive you mapped in Exercise 6-4).

As of the printing of this manual, the iPrint Map Designer worked inconsistently in class on the SLES 8 platform.



Students are free to attempt this optional exercise, but many (or all students) might not see the Map Designer tool properly displayed.

9. Copy the MapDAx.htm file to the /var/opt/novell/httpd/htdocs/ippdocs directory on your NNLS server:
  - a. On your NNLS server, select **Applications > KDE Menu > System > File Manager - Super User Mode**.
  - b. In the Location field, enter **file:/tmp**.
  - c. Right-click **MapDAx.htm** and select **Copy**.
  - d. Go to the **/var/opt/novell/httpd/htdocs/ippdocs** directory.
  - e. Select **Edit**; then select **Paste**.
10. Install and test the printer from your location-based map by doing the following:
  - a. From Internet Explorer on your Windows XP workstation, browse to the following URL:  
**http://DAx.your  
container.digitalairlines.com/ippdocs/MapDAx.htm**
  - b. From the displayed map, select **DAxPRN1**.
  - c. A message appears asking if you want to install the printer.
  - d. Select **OK**.  
After a few moments, a Novell iPrint dialog appears, indicating that the installation was successful.
  - e. Select **OK**.
  - f. Verify that you can print using iPrint by opening WordPad, typing a sentence, and sending it to the printer.
  - g. From your NNLS server, log out as **root** and log back in as **student**.

*(End of Exercise)*

## Summary

Objective	What You Learned
1. Identify the Benefits of iPrint	<p>The following are the benefits and features of iPrint:</p> <ul style="list-style-type: none"><li>■ Global access to printers</li><li>■ Reduced communication costs</li><li>■ Secure printing (SSL)</li><li>■ Unified management</li><li>■ Customized viewing of printers</li></ul>
2. Describe How iPrint Works	<p>iPrint consists of and uses the following protocol and components:</p> <ul style="list-style-type: none"><li>■ IPP</li><li>■ iManager</li><li>■ iPrint Driver Store</li><li>■ iPrint Manager</li><li>■ Printer Objects</li><li>■ iPrint Map Designer</li><li>■ iPrint Client</li></ul>
3. Install and Configure iPrint	<p>To install and configure iPrint, you need to know how to do the following:</p> <ul style="list-style-type: none"><li>■ Install iPrint on a Linux Server</li><li>■ Install the iPrint Client on a Windows Workstation</li><li>■ Create and Start a Driver Store</li><li>■ Add Printer Drivers to Your Driver Store</li><li>■ Create and Start the iPrint Manager</li><li>■ Create Your Printer Objects</li><li>■ Configure Your Network for Workstation and/or User Printers</li><li>■ Create Location-Based Printing Web Pages</li></ul>

Objective	What You Learned
4. Print with iPrint	<p>To print with iPrint, you must be on a Windows workstation, and you must install the iPrint Client and the correct printer driver for each printer you want to use.</p> <p>You can install printers for printing in 2 ways:</p> <ul style="list-style-type: none"><li>■ Use Printer Lists</li><li>■ Use Maps for Location-Based Printing</li></ul>

---



## SECTION 8      Provide Web Mail Access with NNLS

In this section, you learn how to provide email services with the NetMail™ component of Novell® Nterprise™ Linux® Services (NNLS).

### Objectives

1. Identify NetMail Features
2. Describe NetMail Components
3. Describe How NetMail Works
4. Install NetMail
5. Configure and Use NetMail

### Introduction

For any business, providing reliable, standards-based e-mail and calendaring is essential to success.

Organizations that support a large number of deskless workers face the challenge of implementing a scalable, reliable system that is economical to deploy and easy to manage.

In addition, these organizations must ensure that the e-mail system is secure and accessible from anywhere in the world.

Novell NetMail is a full-featured, easy-to-deploy e-mail and calendaring system that simplifies the complexities and lowers the costs of deploying a traditional in-house e-mail system.

NetMail easily integrates with Microsoft® Outlook® and other standards-based e-mail clients, enabling you to improve your end-users' experience without changing your IT infrastructure.

## **Objective 1      Identify NetMail Features**

Novell NetMail is a scalable, high-performance e-mail and calendaring system that is based on Internet-standard messaging and security protocols.

The key benefit of NetMail is that, generally speaking, it is much less expensive than most competing corporate messaging systems.

In addition, NetMail reduces the cost of ownership because its administration interface is very easy to use.

NetMail is designed to fit multiple network environments. It has been tested successfully with as many as 30,000 users on a single Linux® server.

NetMail has been tested to a level of more than 1.1 million messages a day without delivery failures or errors.

NetMail's highly efficient distributed architecture minimizes the number of servers you need to run your e-mail and calendaring system.

NetMail architecture is also multithreaded and multiprocessor-enabled, allowing you to significantly increase system performance by using a multiprocessor server.

NetMail runs on the following platforms:

- NetWare®
- Windows® XP/2000/NT
- Solaris®
- Linux®

NetMail supports Internet-standard messaging and security protocols, enabling users to use their preferred current e-mail clients. NetMail supports

- Post Office Protocol version 3 (POP3)
- Internet Message Access Protocol version 4 (IMAP4)

NetMail is tightly integrated with Novell® eDirectory™. By using eDirectory to centrally store and look up all user and server configuration information, NetMail lets you manage user accounts, hardware and software configuration, and security from a single location.

This integration simplifies user setup and eliminates the need to synchronize changes made to user accounts.

NetMail supports Secure Sockets Layer (SSL) 3.0, the Open SSL implementation of Transport Layer Security (TLS), and Secure Multipurpose Internet Mail Extension (S/MIME) protocols for the highest possible levels of encryption and security.

NetMail can also distribute e-mail and calendaring services across multiple servers. This increases performance while preventing critical processes from being interrupted by a system failure.

NetMail supports multiple languages and time zones, simplifying the exchange of critical messaging and scheduling information between remote offices, customers, and business partners.

## Objective 2      Describe NetMail Components

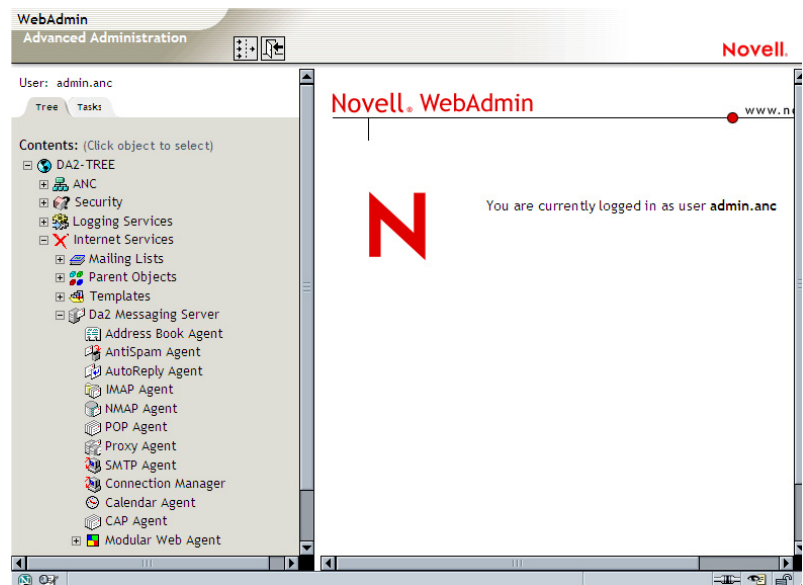
NetMail has a highly modular architecture that provides flexibility without compromising system integrity. Product functions are strategically divided among several different components so you only have to install the components you need.

Based on usage and system resources, you can load those components on a single server or distribute them across multiple servers.

NetMail is composed of the following components:

- Internet Services Container
- Messaging Server
- Parent Objects
- Templates
- List Servers and Mailing Lists
- NetMail Agents
- Installation Directories
- WebAdmin

Figure 8-1



A general description of each component is provided below.

### ***Internet Services Container***

During your initial NetMail installation, the installation program extends the Novell eDirectory schema and creates the *Internet Services Container* object at the root of your eDirectory tree.

Because it is part of NetMail, the Internet Services container differs from other eDirectory Container objects.

There can only be one Internet Services container per tree and, as the messaging system container, it contains only NetMail component objects.

## ***Messaging Server***

A messaging server is any server on the network that hosts 1 or more NetMail agents. In the eDirectory tree, the *Messaging Server* object represents the physical server where you have installed the NetMail software.

The Messaging Server object is represented as a container with server attributes. It contains 1 or more Agent objects and it defines the messaging server's properties.

Each Messaging Server object is associated with a Server object.

You can implement your entire messaging system on a single server or you can distribute NetMail services across multiple messaging servers.

In environments with multiple messaging servers, the servers can be configured to work together as a single, integrated messaging system called a *distributed environment*. They can also be configured to operate as independent sub-systems called *standalone environments*.

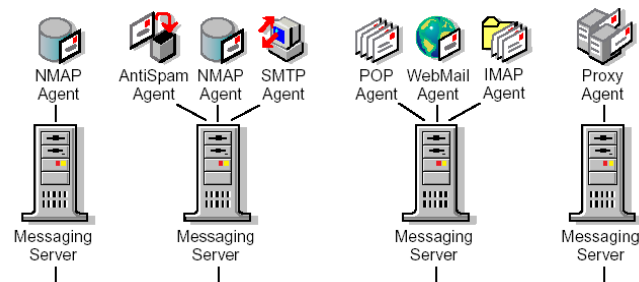
## **Distributed Messaging Servers**

In a distributed messaging system, multiple messaging servers work together as a single, integrated system.

Distributed messaging servers look for other Messaging Server objects in the Internet Services container. If a Messaging Server object or an alias of that object exists in the Internet Services container, other distributed messaging servers can find and interact with it.

A typical distributed messaging system is shown in the following:

**Figure 8-2**



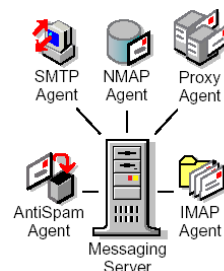
Distributed messaging servers are most often used in larger organizations. These organizations typically require multiple messaging servers to provide load balancing, fault tolerance, and speed.

### Standalone Messaging Servers

A standalone messaging server does not interact with other messaging servers. Instead, it acts as an independent messaging system, exclusively providing all NetMail services to the users within its assigned contexts.

A standalone configuration is shown in the following:

**Figure 8-3**



To configure a standalone messaging server, you must mark the **Distributed Processing Disabled** option in the messaging server's properties. This prevents the messaging server from looking for other Messaging Server objects in the Internet Services container.

You could consider a standalone system if your organization experiences a moderate amount of messaging traffic or if your organization's network environment includes slow WAN links.

### ***Parent Objects***

*Parent objects* enable you to subdivide a single messaging system into configuration subunits. This lets you collectively manage agent services and user settings for specific sets of users.

For example, in a multidomain environment, you can create separate Parent objects for each domain. This lets you manage every domain as if it were a separate messaging system.

The Parent object also lets you selectively grant access to messaging services. You can enable or disable different agent services for each Parent object.

For example, in an ISP environment, you could use Parent objects to give one Hosting Domain access to POP and another access to IMAP, allowing them to bill for individual services.

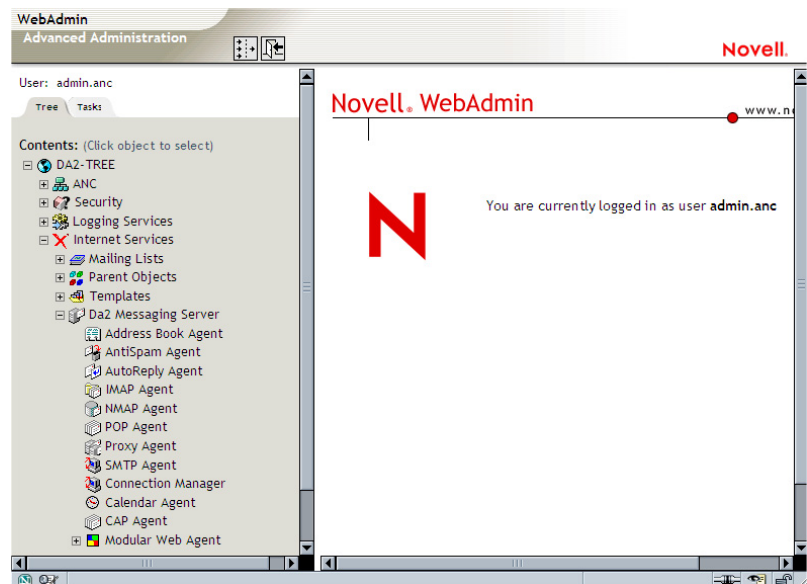
Parent objects can also be used to distribute administrative tasks. Selected users can be given rights to create, delete, modify, or import user accounts in specific Internet domains.

Agents running on both distributed and standalone messaging servers dynamically look up the user's Parent object in the tree to determine what rights the user has to the service.



The *Parent Container* is created in the Internet Services container during installation. This container is the centralized location for Parent objects. NetMail Agents reference the Parent container when looking up user configuration information.

**Figure 8-4**



A Parent object must be represented in the Parent container in order for NetMail Agents to find it. If a Parent object is created elsewhere in the tree, it must be represented by an Alias object in the Parent container.

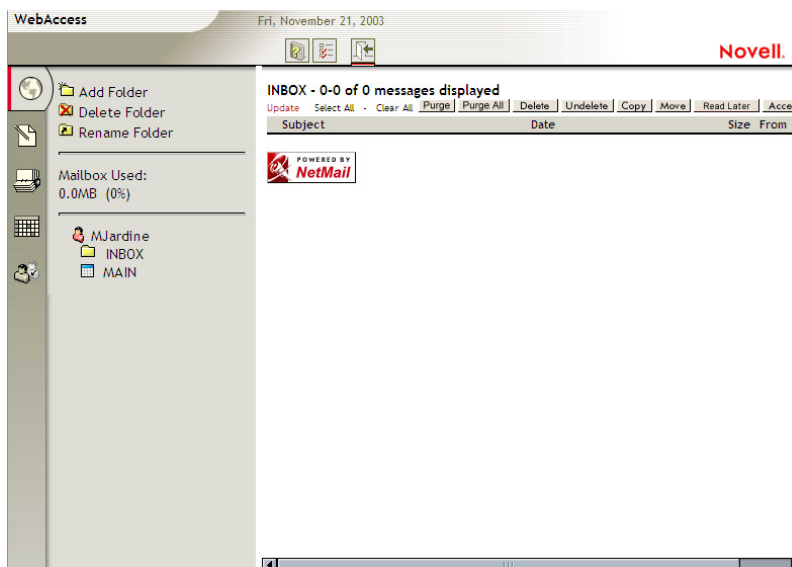
### ***Templates***

The Modular Web Agent provides 2 template-based, mail client interfaces:

- WebAccess
- WebMail

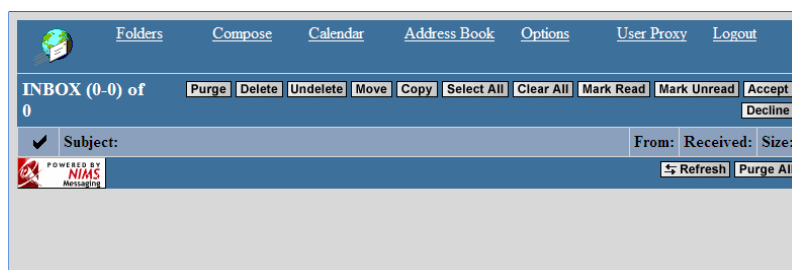
The WebAccess interface provides standard mail client functionality as well as calendaring, scheduling, tasks, and notes. You can also use the WebAccess interface to give selected users access to NetMail administrative functions such as adding, modifying, and deleting user accounts.

Figure 8-5



WebMail also provides standard mail client functionality; in addition, you can use the WebMail interface to give users access to self-administration features like changing passwords and configuring vacation messages.

Figure 8-6



Webacc.CTP and WebMail.CTP each contain everything needed to present their respective client interfaces; images, web pages, and localized text are all compiled in these 2 template files.

When the Modular Web Agent initializes on the messaging server, it simply loads the template files into memory.

The WebAccess and WebMail objects must be created in the tree before they can be loaded on the messaging server or selected in the Modular Web Agent, Parent, and User objects.

The *Template* container is created in the Internet Services container during installation. This container is the centralized location for template objects. The Modular Web Agent references the Templates container when scanning for available templates.



---

A Template object must be represented in the Templates container for the Modular Web Agent to find it. If a Template object is created elsewhere in the tree, it must be represented by an Alias object in the Templates container.

---

### ***List Servers and Mailing Lists***

The NetMail List Agent lets you create and maintain the following:

- List Server
- NDS Mailing Lists
- Mailing Lists Container

#### **List Server**

A list server is a compilation of user email addresses. When a message is sent to the list server, the message is automatically forwarded to every user who has subscribed to the list.

List User objects represent the members of a list. When users subscribe to a list, a List User is added to the respective Mailing List object.

You can also add list members by creating List User objects within the Mailing List object.

## **NDS Mailing Lists**

NDS mailing lists allow you to send messages to eDirectory users.

Unlike Mailing Lists, NDS Mailing Lists are made up of eDirectory objects rather than user email addresses. Selected eDirectory objects can include

- Container objects
- Groups
- Organizational roles
- Aliases
- User objects

If a container object is selected, messages are forwarded to the users within the designated Container object.

## **Mailing Lists Container**

The Mailing Lists container is created in the Internet Services container during installation. This container holds all of the messaging system's available Mailing List objects.

The List Agent references the Mailing Lists container when scanning the message queue for messages addressed to mailing lists.

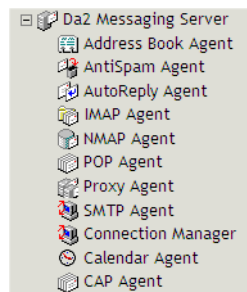


A Mailing List object must be represented in the Mailing Lists container in order for the List Agent to find it. If a Mailing List object is created elsewhere in the tree, it must be represented by an Alias object in the Mailing Lists container.

### ***NetMail Agents***

*NetMail agents* are a set of executables that perform specific product functions. These agents have plug-and-play versatility. They can be combined in a variety of configurations and still maintain the functionality of a single, integrated messaging system.

**Figure 8-7**



This building block architecture enables NetMail to be easily distributed across multiple servers. Depending on agent usage and system resources, each agent can run by itself or in conjunction with other agents on a messaging server.

The table below lists all the NetMail agents and summarizes their functions in the NetMail system.

**Table 8-1**

<b>Agent</b>	<b>Function</b>
Address Book Agent	<p>The Address Book Agent provides read-only LDAP access to eDirectory. Using this agent, any LDAP3-compliant application (such as email or address book clients) can access address book information from eDirectory.</p> <p>Information returned about each user depends on the user's privacy level.</p>

**Table 8-1** *(continued)*

<b>Agent</b>	<b>Function</b>
Alias Agent	<p>The Alias Agent enables your NetMail system to recognize user aliases. The Alias Agent can also be used to automatically populate the User object's Internet Email Address property.</p> <p>The automatic aliasing feature pulls information directly from eDirectory to generate aliases for eDirectory User objects. Aliases can be automatically generated in the following formats:</p> <ul style="list-style-type: none"> <li>■ Firstname_Lastname@Domain</li> <li>■ First Letter+Lastname@Domain (This alias option is limited to eight characters.)</li> <li>■ Firstname.Lastname@Domain</li> <li>■ First.M.Last@Domain</li> <li>■ First_M_Last@Domain</li> </ul> <p>The aliases created via the Alias Agent are not defined as Alias objects in eDirectory. They are maintained by the Alias Agent and are specific to the NetMail message system.</p> <p>Existing Alias objects are recognized by NetMail, but they function independently of the Alias Agent. Messages addressed to Alias objects are automatically delivered to the associated user's mailbox by the NMAP Agent.</p> <p>Aliases can also be defined manually.</p>
AntiSpam Agent	<p>The AntiSpam Agent automatically lets you to build a blackout list of undesirable email domains and addresses.</p> <p>Messages sent from domains and email addresses contained in the blackout list are not accepted by the NetMail system.</p>

**Table 8-1** *(continued)*

<b>Agent</b>	<b>Function</b>
AntiVirus Agent	<p>The NetMail AntiVirus Agent integrates with the following virus applications to provide virus scanning on messages handled by NetMail:</p> <ul style="list-style-type: none"><li>■ McAfee® NetShield®</li><li>■ Command® Antivirus</li><li>■ Computer Associates® InnoculateIT®</li><li>■ Symantec® CarrierScan™</li></ul> <p>You must install one of these products before you can use NetMail's AntiVirus Agent.</p> <p>If a message contains a virus, the AntiVirus Agent immediately deletes it from the message queue.</p> <p>It can be configured to return the message to the sender with a notice indicating what virus the message contained.</p> <p>It can also send a virus alert to the intended message recipients indicating who tried to send the message and what virus the message contained.</p> <p>Virus scanning can be enabled for all users in the messaging system or it can be limited to a group of users.</p> <p>Virus scanning is enabled at the Parent or User objects.</p>



**Table 8-1** *(continued)*

<b>Agent</b>	<b>Function</b>
AutoReply Agent	<p>The AutoReply Agent lets users create custom messages that are automatically sent in response to incoming mail.</p> <p>For example, when users go on vacation, they can create a message that lets others know they are unavailable.</p> <p>The AutoReply Agent also enables users to forward their messages to another email address. Users can specify if they want to retain a copy of the message in their NetMail mailbox or simply redirect the message to the designated address.</p> <p>In addition to forwarding messages to another email address, the AutoReply Agent can forward SMS messages to cellular phones and pages.</p> <p>The AutoReply Agent is not email client specific. Users' forward and autoreply information is stored in their User objects.</p>

**Table 8-1** *(continued)*

Agent	Function
Calendar Agent	<p data-bbox="906 289 1333 380">The Calendar Agent provides automatic status-tracking information for scheduled appointments, tasks, and notes.</p> <p data-bbox="906 396 1455 516">When a user schedules a calendar event, the Calendar Agent processes all “Accept” and “Decline” responses and automatically updates the event’s status information in the organizing user’s calendar.</p> <p data-bbox="906 533 1414 653">Only the user who schedules the event can view who has accepted or declined a calendar event. Attendees only see their own status; every other attendee is viewed as pending.</p> <p data-bbox="906 669 1455 856">If you choose not to run the Calendar Agent, users receive I-cal status messages in their Inbox. Because the status information is in I-cal format, the event organizer might not be able to discern whether a recipient has accepted or declined the appointment.</p> <p data-bbox="906 873 1455 963">I-cal mail clients, such as Microsoft Outlook* XP, also provide automatic status tracking for scheduled appointments.</p> <p data-bbox="906 980 1455 1100">If you are exclusively using an I-cal compliant mail client, you can choose to either have NetMail manage status tracking via the Calendar Agent or to have the mail client manage status tracking.</p> <p data-bbox="906 1117 1446 1207">If you are using the Modular Web client, you must run the Calendar Agent to provide automatic status tracking for scheduled appointments.</p>

**Table 8-1** *(continued)*

<b>Agent</b>	<b>Function</b>
Connection Manager	<p>The Connection Manager Agent keeps track of authenticated users.</p> <p>When a user logs in via POP3 or IMAP4, the POP or IMAP Agent grabs the client's IP address and sends it to the Connection Manager Agent.</p> <p>Connection Manager then keeps track of the IP address for a designated time period (the default is 15 minutes).</p> <p>Any agent can query Connection Manager for authenticated IP addresses.</p> <p>In NetMail, this service is used by the SMTP Agent for SMTP-after-POP. This is a UBE Protection feature that prevents unauthorized users from relaying mail through your messaging system.</p> <p>The Connection Manager Agent listens to other agents on UDP port 689 and should always be protected by a firewall.</p>
IMAP Agent	<p>The IMAP Agent enables IMAP4 clients to download mail from the messaging system.</p> <p>In addition to the basic NetMail memory requirements, the IMAP Agent requires approximately 300 KB per expected simultaneous connection to your NetMail system.</p> <p>For users to access their mailboxes, your messaging system must include at least 1 POP, IMAP, or Modular Web Agent.</p>

**Table 8-1** *(continued)*

<b>Agent</b>	<b>Function</b>
List Server Agent	<p>The List Server Agent enables your NetMail system to function as a list server.</p> <p>The list server works in conjunction with the NDS Mailing List and Mailing List objects.</p> <p>NDS-based mailing lists are built from Container, Group, Role, or User objects. General mailing lists require the full email address of each subscriber.</p> <p>When you send messages to a mailing list, undeliverable status information is not returned if one of the messages is rejected.</p>

**Table 8-1** *(continued)*

Agent	Function
Modular Web Agent	<p data-bbox="906 283 1477 378">The Modular Web Agent provides the template interfaces for the NetMail mail client. Two templates are available:</p> <ul data-bbox="906 388 1063 451" style="list-style-type: none"><li data-bbox="906 388 1063 409">■ WebAccess</li><li data-bbox="906 420 1063 451">■ WebMail</li></ul> <p data-bbox="906 462 1477 556">Using either template, users can send and receive mail, manage folders, and set mail preferences from any standard Internet browser.</p> <p data-bbox="906 567 1477 630">The Modular Web Agent also includes several modules which enable various client functions:</p> <ul data-bbox="906 640 1477 955" style="list-style-type: none"><li data-bbox="906 640 1477 703">■ Mail Module: Provides mail and address book functions.</li><li data-bbox="906 714 1477 798">■ Calendar Module: Enables the WebAccess calendar features, including appointments, tasks, and notes.</li><li data-bbox="906 808 1477 871">■ Preferences Module: Allows users to change their passwords.</li><li data-bbox="906 882 1477 955">■ Task-Oriented Management Module: Lets you delegate administrative functions such as creating, modifying, or deleting users.</li></ul> <p data-bbox="906 966 1477 1092">In addition to the basic NetMail memory requirements, the Modular Web Agent requires approximately 300 KB per expected simultaneous connection to your NetMail system.</p> <p data-bbox="906 1102 1477 1197">For users to access their mailboxes, your messaging system must include at least 1 POP, IMAP, or Modular Web Agent.</p>

**Table 8-1** *(continued)*

Agent	Function
NMAP Agent	<p>The NMAP Agent is responsible for managing message processing and delivery.</p> <p>It coordinates everything that happens from the time a message enters the message queue to when it is delivered to the user's mailbox or passed off for delivery via the Internet.</p> <p>It is the only agent that has direct access to the message store. Consequently, every messaging system requires at least one NMAP Agent and every user within the messaging system must be included in one of the NMAP Agent's contexts.</p> <p>The NMAP Agent's 3 primary functions are</p> <ul style="list-style-type: none"> <li>■ <b>Managing the message store:</b> By default, the NMAP Agent creates a mailbox directory for every User object within its assigned contexts.</li> </ul> <p>Because NMAP is the only agent with physical access to the message store, the message store directories are always created on servers running the NMAP Agent.</p> <ul style="list-style-type: none"> <li>■ <b>Managing the message queue:</b> The NMAP Agent coordinates all message processing in the message queue. The Mail Load utility monitors and regulates the NMAP Agent's thread usage to maintain optimal efficiency.</li> <li>■ <b>Providing IP access to the message store and message queue for the other NetMail agents.</b></li> </ul>
POP Agent	<p>The POP Agent enables POP3 mail clients to download mail from the messaging system.</p> <p>For users to access their mailboxes, your messaging system must include at least 1 POP, IMAP, or Modular Web Agent.</p>

**Table 8-1** *(continued)*

<b>Agent</b>	<b>Function</b>
Proxy Agent	<p>The Proxy Agent allows users to manage several email accounts from a central mailbox.</p> <p>Users can retrieve messages from up to 3 POP3 or IMAP4 email accounts on other messaging systems. All messages retrieved from these accounts are stored in the user's NetMail mailbox as if it were the original destination.</p> <p>Depending on the user settings, a copy of retrieved messages can be left in the original mailbox or the messages can be deleted from the host server. All proxy information is stored in the User object.</p>

**Table 8-1** *(continued)*

Agent	Function
SMTP Agent	<p data-bbox="906 289 1414 411">The SMTP Agent is the gateway between the Internet and your messaging system. Its primary function is to transfer messages to and from the Internet.</p> <p data-bbox="906 428 1451 550">This agent must be running on at least one messaging server for users to send local messages from POP or IMAP clients or to send messages over the Internet.</p> <p data-bbox="906 567 1409 625">It controls which domains are recognized by the messaging system.</p> <p data-bbox="906 642 1425 701">The SMTP Agent also provides most of NetMail's UBE protection features, including</p> <ul data-bbox="906 718 1398 932" style="list-style-type: none"> <li>■ Reverse DNS look-ups</li> <li>■ Real-time Black Hole (RBL) look-ups</li> <li>■ Host blocking by IP address</li> <li>■ ESMTP authentication</li> <li>■ SMTP-after-POP</li> <li>■ Restrictions on remote sending by IP address</li> </ul> <p data-bbox="906 949 1357 1008">Additional SMTP Agent options include the following:</p> <ul data-bbox="906 1024 1451 1289" style="list-style-type: none"> <li>■ A message size limit for inbound and outbound Internet messages</li> <li>■ Controls on standard SMTP commands that pose security risks or facilitate connections with offices that have intermittent Internet connections</li> <li>■ A Mail Relay Host definition that allows you to funnel all remote messages through a single SMTP server rather than having every SMTP Agent individually access the Internet</li> </ul>



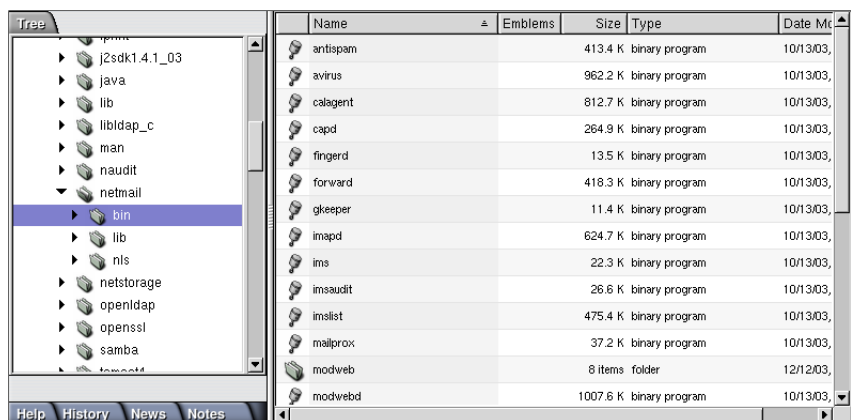
## Installation Directories

During a default installation, NetMail files are copied to the `/var/opt/novell/netmail` and the `/opt/novell/netmail` directories.

The `/var/opt/novell/netmail` directory contains the single copy message store and the user directories. The `/opt/novell/netmail` directory contains the NetMail binaries.

The mail NetMail binary is named **ims** and is located in `/opt/novell/netmail/bin`. Each NetMail agent binary is also located in this directory, as shown below:

Figure 8-8



Name	Emblems	Size	Type	Date Modified
antispm		413.4 K	binary program	10/13/03
avrus		962.2 K	binary program	10/13/03
calagent		812.7 K	binary program	10/13/03
capd		264.9 K	binary program	10/13/03
fingerd		13.5 K	binary program	10/13/03
forward		418.3 K	binary program	10/13/03
gkeeper		11.4 K	binary program	10/13/03
imapd		624.7 K	binary program	10/13/03
ims		22.3 K	binary program	10/13/03
imsaudit		26.6 K	binary program	10/13/03
imslist		475.4 K	binary program	10/13/03
mailprox		37.2 K	binary program	10/13/03
modweb		8 items	folder	12/12/03
modwebd		1007.6 K	binary program	10/13/03

## WebAdmin

WebAdmin is a browser-based, platform-independent, system management tool.

WebAdmin is not represented by an Agent object in eDirectory. Instead, the agent is manually launched at the server.

You access WebAdmin through your browser by accessing iManager and selecting Launch NetMail Management.

WebAdmin runs on port 8018 (insecure) and on port 8020 (secure). It can be accessed with a web browser at **http://server\_ip:8018** or **https://server\_ip:8020**.

### **Objective 3      Describe How NetMail Works**

In this object, you learn the following:

- Changes Made to Existing Objects
- How Messages Are Processed

#### ***Changes Made to Existing Objects***

When NetMail is installed, it expands the eDirectory schema to include NetMail-related objects and attributes. Existing Directory objects, such as Container, User, and even Server objects, take on new NetMail attributes.

To understand this process, you need to know what happens to the following:

- Container Objects
- User Objects

#### **Container Objects**

NetMail properties added to Container objects include the option to

- Define a custom message store for users within the current container
- Define a container-specific domain name

The container-specific message store is the directory where the mailboxes for users in the current container are located. This does not affect the general message queue and SCMS directories, which will always be located in the default message store directory.

If configured, container domains appear in the From field of user messages and are referenced by the Address Book Agent in returning users' address book information. Container domains do not allow you to have non-unique user IDs in different containers.

## **User Objects**

The NetMail attributes added to User objects replicate many of the user configuration options available in the Modular Web client, including privacy level, forward and autoreply messages, and proxy configuration.

Providing the user configuration options in both the User object and Modular Web client gives you the option of centrally managing these options through the User object or allowing users to self-manage these options through the Modular Web client.

The User object also replicates many of the configuration options available in Parent objects. This duplication lets you configure general settings in the Parent object, but create exceptions for individual User objects.

## ***How Messages Are Processed***

The core function of NetMail is message processing. Every message entering your messaging system must be processed by NetMail agents.

Depending on which agents you have running on your messaging system, the message might be checked against a system blacklist, forwarded to another email address, or filtered according to user-defined rules.

The file system structure used for message processing is comprised of 3 directories:

- Message Store
- Single Copy Message Store
- Message Queue

Everything that happens from the time a message enters the messaging system to when it is delivered to the user's mailbox occurs in these directories.

### Message Store

The message store is the directory structure that holds users' mailboxes and messages. All other information required by your NetMail system is stored in eDirectory. Every server running an NMAP Agent has a message store.

On a Linux server, the default message store location is **/var/opt/novell/netmail/users**. This location, of course, can be changed using WebAdmin.

The NMAP Agent creates the following mailbox directory structure within the message store directory for every User object in its assigned contexts:

Table 8-2

Directory	Function
./users	Collective directory for all user mailboxes.

**Table 8-2** *(continued)*

Directory	Function
<i>.users/user_name/</i>	A unique directory for each user's mailbox.
<i>.users/user_name/inbox.box</i>	The file containing all messages in the user's InBox (text and attachments). New messages are appended to the end of the file.
<i>.users/user_name/inbox.idx</i>	The index of all messages in the inbox.box file.
<i>.users/user_name/mail.cal</i>	The calendar store. This file contains the user's calendar items, such as tasks, appointments, and notes.
<i>.users/user_name/main.idc</i>	The index of all items in the mail.cal file.
<i>.users/user_name/folder_name.box</i>	A unique file for each folder in the user's mailbox. It contains the folder's messages (text and attachments). New messages are appended to the end of the file.
<i>.users/user_name/folder_name.idx</i>	The index of all messages in the <i>folder_name.box</i> file.

**Table 8-2** *(continued)*

Directory	Function
<i>.users/user_name/folder_name</i>	<p>A unique directory for each folder that contains subfolders.</p> <p>More disk space is required to maintain directories than files on the messaging server.</p> <p>Consequently, subfolders are very expensive in terms of server resources.</p>
<i>.users/user_name/folder_name/subfolder_name.box</i>	<p>A unique file for each subfolder in the parent folder. It contains the subfolder's messages (text and attachments). New messages are appended to the end of the file.</p>
<i>.users/user_name/folder_name/subfolder_name.idx</i>	<p>The index of all messages in the subfolder_name.box file.</p>

### Single Copy Message Store

If a message is sent to 2 or more multiple recipients and the message is over 2 KB, NMAP does not replicate the message in all the users' mailboxes.

Instead, a pointer message is sent to the individual mailboxes directing NMAP to the complete message in the Single-Copy Message Store (SCMS) directory.

When the last user downloads or deletes the message, it is deleted from the shared directory.

The SCMS directory structure stores messages in sorting directories that correspond to the last character in their hexadecimal filename (0-9 or A-F).

Sorting messages by the last character in their hexadecimal filename allows the NMAP Agent to efficiently retrieve messages stored in the SCMS directories.

The SCMS directory structure is as follows:

**Table 8-3**

Directory	Function
<code>./scms</code>	Single Copy Message Store (SCMS) directory.
<code>./scms/0-9, A-F</code>	Sorting directories. Messages are sorted in these directories by the last hash value in the SCMS filename.
<code>./scms/0-9, A-Fxxxx</code>	File with hashed filename ( <i>xxxx</i> represents a hashed value) containing the multi-recipient message and any attachments.
<code>./scms/0-9, A-Fxxxx.cnt</code>	Counter file. Its value is the total number of recipients. As each recipient deletes the message, the counter file decrements by 1.  When its value is 0, the message and counter files are deleted.

## Message Queue

Each message store has an associated message queue. The message queue is the directory where messages are processed as they enter or leave your NetMail system.

The NMAP Agent is responsible for managing the message queue. When the NMAP Agent receives a message, it downloads the file to the message queue directory located in **/var/opt/novell/netmail/spool**.

## Message Processing in the Message Queue

As the NMAP Agent downloads a message to the message queue directory, it generates 2 files:

- **Cxxxxxxx.in**
- **Dxxxxxxx.in**

The **xxxxxxx** represents a hashed value of the date and time the message was sent. The **.in** extension indicates the message is inbound.

The **Cxxxxxxx.\*** file is the control file envelope. The control file is generated from information received in the initial SMTP exchange. It contains To and From information along with any message flags. All message-processing functions are performed on the control file.

The **Dxxxxxxx.\*** file is the data file. It contains the message header and message text. Because most message processing is done through the control file, the data file is rarely opened.

After the message is downloaded, the NMAP agent gives the data file an **.MSG** extension and then begins moving the control file through nine queues.



The process of moving the control file between queues is a simple matter of changing its filename extension to reflect the current queue number.

The following table outlines the message-processing functions associated with each queue.

**Table 8-4**

Filename	Function
xxxxxxxx.000	Queue 0 is the prep queue. NMAP makes sure the control file meets all processing requirements and the AntiVirus Agent scans the data file.
xxxxxxxx.001	Message is processed by the AntiSpam Agent and/or the List Agent.
xxxxxxxx.002	Message is processed by the Alias Agent and/or the AutoReply Agent.
xxxxxxxx.003	Message is processed by the Rule Agent.
xxxxxxxx.004	Not currently used by a NetMail agent; might be used by a third-party or custom agent.
xxxxxxxx.005	Message is processed by the Calendar Agent.
xxxxxxxx.006	Messages to recipients within the messaging system are delivered by the NMAP Agent.

**Table 8-4** *(continued)*

Filename	Function
<i>xxxxxxxx.007</i>	Messages to recipients outside the messaging system are picked up for delivery by the SMTP Agent.
<i>xxxxxxxx.008</i>	This is a holding queue for bounced messages.  The NMAP Agent leaves bounced messages in queue 8 until it has time to reprocess them.

When the NMAP Agent moves a message into a queue, it notifies the agent registered on that queue.

The registered agent then scans the control file and performs its assigned function. If the agent modifies the message, NMAP returns the message to queue 0 for reprocessing. If no changes are made, NMAP advances the message to the next queue.

**Table 8-5**

Stage	Agent	Description
1	User	Someone sends a message over the Internet to a user in your messaging system.
2	SMTP Agent	The SMTP Agent receives the message and transfers the message to its assigned NMAP Agent.
3	NMAP Agent	In downloading the message to the message queue directory, the NMAP Agent creates the message control file ( <i>Cxxxxxxxx.in</i> ) and data file ( <i>Dxxxxxxxx.in</i> ).

**Table 8-5** *(continued)*

Stage	Agent	Description
4	NMAP Agent	<p>After the message is downloaded, the NMAP Agent gives the data file an .MSG extension and moves the control file to queue 0 by changing the file extension from .IN to .000.</p> <p>In queue 0, the NMAP Agent verifies that the control file meets all processing requirements. It then notifies the AntiVirus Agent that it has a message to process.</p>
	AntiVirus Agent	<p>The AntiVirus Agent then scans the data file for any attachments. Attachments are sent to a third-party virus engine to be scanned.</p> <p>Assuming the file is clean, the NMAP Agent then moves the control file to queue 1 by changing the file extension from .000 to .001 and notifies the AntiSpam and/or List Agents that they have a message to process.</p>
5	AntiSpam Agent	Queue 1 is shared by the AntiSpam Agent and the List Agent.
	List Agent	<p>The AntiSpam Agent checks the control file to see if the sender is on its blackout list. If the sender is on the blackout list, the message is deleted from the queue.</p> <p>The List Agent checks the control file to see if the message is addressed to a mailing list. If it is, the List Agent generates a new message with the names of the individual users in the mailing list.</p> <p>The new message is returned to queue 0 and the original message is deleted.</p>

**Table 8-5** *(continued)*

Stage	Agent	Description
6	NMAP Agent	If no changes have been made, the NMAP Agent moves the file to queue 2 by changing the file extension from .001 to .002 and notifies the Alias and/or AutoReply Agents that they have a message to process.
7	Alias Agent AutoReply Agent	<p>Queue 2 is shared by the Alias Agent and the AutoReply Agent.</p> <p>The Alias Agent checks the control file to see if the recipient matches any of its defined aliases. If so, the Alias Agent replaces the alias with its corresponding email address.</p> <p>The AutoReply Agent checks the recipient's User object to see if the recipient has either configured an autoreply message or forwarded messages to another email account. The user's forward and autoreply information is stored in his or her User object.</p> <p>If the recipient has forwarded his or her mail, the agent adds the forwarded address to the recipient list. If the recipient did not request a copy of the message, the agent replaces the recipient's name with the forwarded address.</p> <p>If the recipient has configured an autoreply message, the agent generates a new message and hands it off to NMAP for processing in the message queue.</p>

**Table 8-5** *(continued)*

Stage	Agent	Description
8	NMAP Agent	<p>If the original message has been modified, the NMAP Agent returns the message to queue 0 for reprocessing.</p> <p>If no changes have been made, the NMAP Agent moves the file to queue 3 by changing the file extension from .002 to .003 and notifies the Rule Agent that it has a message to process.</p>
9	Rule Agent	<p>In queue 3, the Rule Agent checks the message against the recipient's defined rules which are stored in the user's User object. If the message matches 1 of the rule conditions, the Rule Agent applies the rule.</p> <p>If a rule directs the message to a specific folder, the Rule Agent adds the destination folder information to the control file in IMAP format. Using the IMAP protocol to designate the destination folder enables the message to be routed to the correct folder in any standards-based email client.</p>
10	NMAP Agent	<p>If the message has been modified, the NMAP Agent returns the message to queue 0 for reprocessing.</p> <p>If no changes were made, the NMAP Agent moves the file to queue 5 by changing the file extension from .003 to .005.</p>

**Table 8-5** *(continued)*

Stage	Agent	Description
11	Calendar Agent	<p>In queue 5, the Calendar Agent checks to see if the message is an “Accept” or “Decline” reply to a scheduled appointment.</p> <p>If the message is a response to an appointment and if the person who scheduled the appointment is a local user, the Calendar Agent updates the user’s calendar store (mail.cal) to indicate the sender accepted or declined the appointment.</p>
12	NMAP Agent	<p>If the message has been modified, the NMAP Agent returns the message to queue 0 for reprocessing.</p> <p>If no changes were made, the NMAP Agent moves the file to queue 6 by changing the file extension from .005 to .006.</p>
13	NMAP Agent	<p>In queue 6, the NMAP Agent checks the recipient list in the control file envelope; it then performs 1 of the following actions:</p> <ul style="list-style-type: none"> <li>■ If any of the recipients are local users, the NMAP Agent delivers a copy of the message to the users’ mailboxes.</li> <li>■ If the message exceeds the Single Copy Message Store (SCMS) threshold, the message is copied to the SCMS directory.</li> <li>■ If some of the recipients are not in the current NMAP Agent’s context but are within the Directory tree, the NMAP Agent transfers the message to the NMAP Agents assigned to the users’ contexts.</li> <li>■ If any recipients are not within the Directory tree, the NMAP Agent moves the message to queue 7 for remote delivery.</li> </ul>

**Table 8-5** *(continued)*

Stage	Agent	Description
14	NMAP Agent	In queue 7, the NMAP Agent passes the message to the SMTP Agent for remote delivery.

## Objective 4 Install NetMail

To install NetMail on your Linux server, you need to know how to do the following:

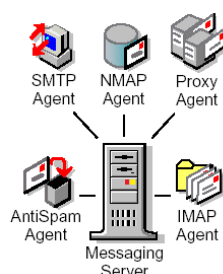
- Design Your NetMail System
- Meet System Requirements
- Gather Required Information
- Use the NNLS Install Feature

### *Design Your NetMail System*

As mentioned previously, NetMail can be configured in 2 ways:

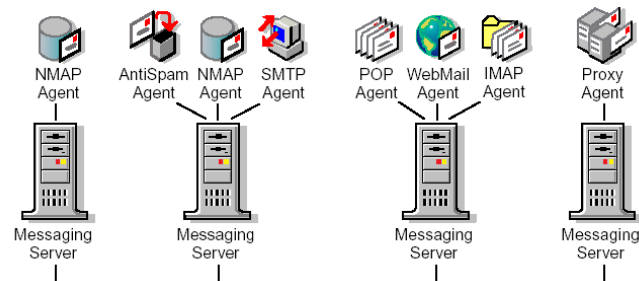
- Single-Server Messaging
- Distributed-Server Messaging

In a single-server messaging system, all of the NetMail components run on the same server, as shown in the following:

**Figure 8-9**

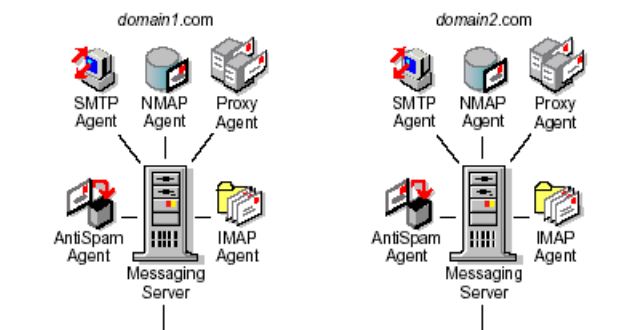
In a distributed-server messaging system, the NetMail components are distributed across 2 or more servers, as shown in the following:

**Figure 8-10**



NetMail can also be configured to service multiple Internet domains using the same eDirectory tree. In this case, multiple single-server messaging systems can be configured to service separate domains, as shown in the following:

**Figure 8-11**



If performance and scalability are issues for your organization, you can implement a distributed system and then duplicate agents on different servers.

When designing your NetMail system, you need to identify the following:



- Which server(s) will host NetMail agents?
- Which agents will be located on a given server?
- Which domains will be serviced by each messaging server?
- Does your organization need fault tolerance and scalability by deploying the same agents on multiple servers?

### ***Meet System Requirements***

To install NetMail, you must meet the following system requirements:

- Make sure you're running 1 of the following:
  - Red Hat® Linux AS 2.1
  - Red Hat Linux ES 2.1
  - SuSE® SLES 8
- Make sure eDirectory 8.7.3 or later for Linux is installed.
- Make sure your system CPU is at least a 750 MHz Pentium® III or Athlon.
- Make sure you have at least 512 MB of system RAM.
- Make sure you have 20 MB of disk space free for installation. Disk space for the NetMail message store varies, based on the number of users and the amount of disk space allowed per mailbox.
- Each server hosting a NetMail service must have an eDirectory replica of the partition containing the users who will use the messaging service.
- Make sure the eDirectory tree is synchronized and healthy.
- Make sure you have Admin rights to the eDirectory tree where you plan to install NetMail.

- Decide what you want to name the Messaging Server object. The default is ***server\_name* Messaging Server**.
- Make sure you know the Internet domain your NetMail system will service and the IP addresses of primary and secondary DNS servers.
- Check for duplicate port assignments on your server. NetMail uses the following ports by default:

Table 8-6

Port	Protocol	Agent
25	SMTP	SMTP Agent
52080	HTTP	Modular Web Agent
8018	HTTP	WebAdmin
110	POP	POP Agent
143	IMAP	IMAP Agent
52389	LDAP	Address Book Agent
689 UDP		Connection Manager
689 TCP	NMAP	NMAP Agent
52443	HTTPS	Modular Web Agent
8020	HTTPS	WebAdmin
995	SSL over POP	POP
993	SSL over IMAP	IMAP

- Stop the default mail service, such as sendmail or postfix, on the server where you will install NetMail. On many systems, sendmail is configured to automatically start each time the server starts.

To change this on Red Hat, open a terminal session as root and enter **chkconfig --level 2345 sendmail off**.

To change this on SuSE, open a terminal session as root and enter **chkconfig sendmail off**.

- Check the `/etc/syslog.conf` file for a line that starts with **mail.\***. If it exists, comment it out. In debug mode, mail produces enough syslog messages to fill most disks in a short period of time.

### ***Gather Required Information***

Before you start installing NetMail, gather the following information:

**Table 8-7**

Parameter	Value
Admin Name with Context	
Admin Password	
NetMail Primary DNS Server	
NetMail Secondary DNS Server	
Domain Name for NetMail Server	
NetMail WebAccess HTTP Port	
NetMail WebAccess HTTPS Port	
NetMail LDAP Port	

### ***Use the NNLS Install Feature***

To install NetMail from NNLS, do the following:

1. Perform the steps to do a custom installation.



---

If necessary, see Section 2 for details on how to perform a custom installation.

---

2. Deselect the services you *do not want* to install, select the NetMail service; then continue.

If eDirectory has not previously been installed, notice that it is selected by default when you select NetMail (along with other required components such as Apache and Tomcat).

If eDirectory has been previously installed, the install program will indicate which components are already installed.

3. Accept the license agreement.
4. (Conditional) If prompted for the location of the NICI Foundation Key (NFK) file, enter the path to the NFK file.  
  
You will only be asked for the NICI Foundation Key if eDirectory has not previously been installed.
5. Enter the information requested at each prompt (see Table 8-7).
6. View the summary information and make any necessary corrections.
7. When all the information is correct, finish the install.
8. View the readme file and save the installation settings log file.

## Objective 5      **Configure and Use NetMail**

Each agent in the NetMail system has its own set of properties that can be configured. This objective is limited to the following configuration tasks:

- Running WebAdmin
- Configuring the Contexts Serviced by the NMAP Agent
- Selecting a Web Interface Template

### ***Running WebAdmin***

WebAdmin is the utility used to configure the NetMail system. It is a browser-based utility that is integrated into iManager.

To access WebAdmin directly, open a web browser and enter **http://your\_server\_IP:8018** or **https://your\_server\_IP:8020**

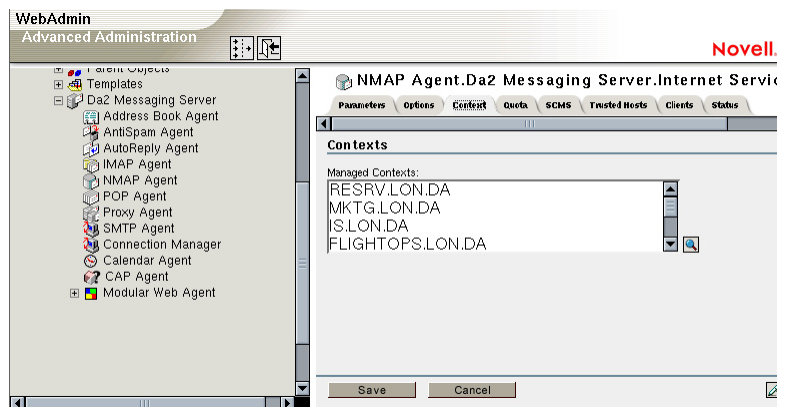
To access WebAdmin from within iManager, complete the following:

1. At the left, scroll down and select **Launch NetMail Management**.
2. In the WebAdminServer name field, browse to and select your **WebAdmin server**; then select **OK**.

## Configuring the Contexts Serviced by the NMAP Agent

The NetMail system services all users in the containers configured in the Context property of the NMAP Agent, as shown in the following:

Figure 8-12



The first context was defined when the NMAP Agent was created and is the same as the context where the server resides. Additional user contexts can be added from the Context page.

Because NMAP contexts are not inherited, each container or sub-container serviced by an NMAP Agent must be added to that agent's context list.

Messaging services are automatically provided to every user in the NMAP Agent's assigned contexts. User mailboxes are created in the local message store directory the first time users receive a message.



Do not add the same context to multiple NMAP Agents.

NMAP contexts are tracked by the messaging server. When it starts, the messaging server generates a list of NMAP contexts and holds it in server memory. This list is used to generate aliases and address books.

Changes made to the list of contexts is dynamically updated. The NetMail service doesn't need to be restarted. However, if users are added to a context while the server is running, they won't appear in the address book until the server is restarted.

To configure the eDirectory contexts service by the NMAP Agent, do the following:

1. In WebAdmin, expand **Internet Services**.
2. Expand **Messaging Server**.
3. Select **NMAP Agent**.
4. Select **Context**.
5. Select the **magnifying glass** icon.
6. Browse to and select each *container* you want the NMAP Agent to service; then select **Save**.
7. Select **Save**.

### ***Selecting a Web Interface Template***

Templates control the appearance of the Modular Web Agent's mail client interface. By default, 2 templates ship with NetMail:

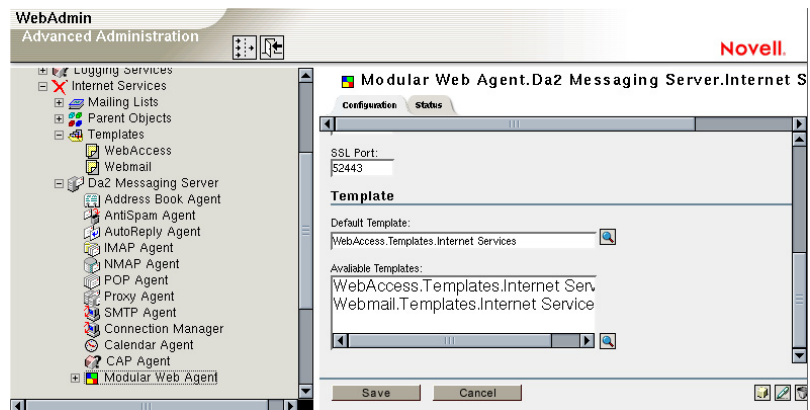
- WebAccess (Webacc.CTP)
- WebMail (WebMail.CTP)

Each template contains everything needed to present its respective client interface. When the Modular Web Agent initializes on the messaging server, it simply loads the template files into memory.

To select the default template, do the following:

1. In WebAdmin, expand **Internet Services**.
2. Expand **Messaging Server**.
3. Select **Modular Web Agent**.
4. Scroll down to the Default Template field, as shown in the following:

Figure 8-13



5. Select the **magnifying glass** icon.
6. Browse to and select the *template object* you want to use.  
By default, the templates are located in Templates.Internet Services.
7. Select **Save**.



If you enter incorrect login information to access WebAccess or WebMail when using a Mozilla browser, the login dialog box is not displayed.

You must either refresh the window or re-enter the URL. If you click the Log In Again link after logging out of WebAccess or WebMail, you are taken to the logged-out page. You must start a new browser to get to the login prompt.



**20 Minutes****Exercise 8-1 Configure and Test NetMail for Your Digital Airlines Office**

In this exercise, you configure the NMAP Agent to service your entire container and test the mail server.

Do the following:

1. Verify that sendmail isn't running:
  - a. On your NNLS server, open a terminal session.
  - b. Change to the root user by entering **su -** and a password of **novell**.
  - c. Enter **chkconfig --list sendmail**.  
The sendmail daemon should be set to *off* for run levels 3 (non-graphical boot) and 5 (graphical boot).

The messaging server is dependent on the DNS server as a name resolver, even if you are using IP addresses instead of DNS names.

2. Make sure DNS is resolving your server's IP address correctly by entering **ping DAx.your container.digitalairlines.com** (press **Ctrl+C** to stop the ping).

For example, if you are working on DA3, you would enter **ping DA3.atl.digitalairlines.com**.

3. Access WebAdmin and verify that NetMail is configured to service users in your container:
  - a. On your NNLS server, open a browser window and enter **https://DAx.your container.digitalairlines.com:8020**.  
The Novell WebAdmin login page appears.
  - b. Log in as **admin** with a password of **novell**.
  - c. On the left, expand **Internet Services**.
  - d. Expand **DAx Messaging Server**.
  - e. Select **NMAP Agent**.
  - f. (Conditional) If an About Popups dialog appears, select **No**.  
An NMAP Agent page appears with several tabs.
  - g. Select the **Context** tab.
  - h. Verify that **your container** is listed.

- i. (Conditional) If your container is not listed, add ***your container*** (by using the magnifying glass icon); then select **Save**.
4. Verify that your POP Agent is enabled:
  - a. Under **DAx Messaging Server**, select **POP Agent**.
  - b. Verify that the agent is enabled
  - c. (Conditional) If the agent is not enabled, select **Enabled** and then select **Save**.
5. Set the server time zone:
  - a. On the left, select **Modular Web Agent**.
  - b. On the right from the Default Time Zone drop-down list, select ***your time zone***.

You do this to make sure the Messaging Server's time zone is the same as the NNLS server's time zone.
  - c. Select **Save**.
6. Test the configuration.
  - a. From the current Mozilla web browser window, open a new browser window by pressing **Ctrl+N**.
  - b. Enter **http://DAx.*your container*.digitalairlines.com:52080**.
  - c. When prompted to log in, enter **JJackson** with a password of **novell**; then select **OK**.

A WebAccess page appears.
  - d. At the left, select the **Compose** icon.
  - e. In the To field, enter **AGresko@*your container*.digitalairlines.com**.

For example, if you're working on DA3, you would enter **AGresko@atl.digitalairlines.com**.
  - f. Enter ***text*** in the Subject and Message fields.



---

If you leave the Message field empty, the message won't be sent.

---

- g. Select **Send**.
- h. Wait for the Send window to close: then, at the top of the WebAccess page, select the **Exit** icon.
- i. Select **Log in**.
- j. When prompted to log in, authenticate as **AGresko** with a password of **novell**.  
You should see the message you just sent from the other account.
- k. Select the *message*.
- l. Try sending email to other users in your tree.
- m. Try sending an email message to a user in another tree.
- n. When you finish, close the browser windows.

***(End of Exercise)***

## Summary

Objective	Summary
1. Identify NetMail Features	<p>Novell NetMail is a high-performance e-mail and calendaring system based on Internet-standard messaging and security protocols.</p> <p>NetMail is designed to fit multiple network environments. It has been tested successfully with as many as 30,000 users on a single Linux server.</p> <p>NetMail's highly efficient distributed architecture minimizes the number of servers you need to run your e-mail and calendaring system.</p> <p>NetMail is tightly integrated with Novell eDirectory.</p> <p>NetMail can also distribute e-mail and calendaring services across multiple servers. This increases performance while preventing critical processes from being interrupted by a system failure.</p>

---

Objective	Summary
<b>2. Describe NetMail Components</b>	<p>NetMail is composed of the following components:</p> <ul style="list-style-type: none"><li>■ Internet Services Container</li><li>■ Messaging Server</li><li>■ Parent Objects</li><li>■ Templates</li><li>■ List Servers and Mailing Lists</li><li>■ NetMail Agents<ul style="list-style-type: none"><li>■ Address Book Agent</li><li>■ Alias Agent</li><li>■ AntiSpam Agent</li><li>■ AntiVirus Agent</li><li>■ AutoReply Agent</li><li>■ Calendar Agent</li><li>■ Connection Manager</li><li>■ IMAP Agent</li><li>■ List Server Agent</li><li>■ Modular Web Agent</li><li>■ NMAP Agent</li><li>■ POP Agent</li><li>■ Proxy Agent</li><li>■ SMTP Agent</li></ul></li><li>■ WebAdmin</li></ul> <p>During a default installation, NetMail files are copied to the /var/opt/novell/netmail and /opt/novell/netmail directories.</p>

---

Objective	Summary
<b>3. Describe How NetMail Works</b>	<p>When NetMail is installed, it expands the eDirectory schema to include NetMail-related objects and attributes.</p> <p>Existing Directory objects, such as Container, User, and even Server objects, take on new NetMail attributes.</p> <p>The core function of NetMail is message processing. Every message entering your messaging system must be processed by NetMail agents.</p> <p>Depending on which agents you have running on your messaging system, the message might be checked against a system blacklist, forwarded to another email address, or filtered according to user-defined rules.</p>

---

Objective	Summary
4. Install NetMail	<p>NetMail can be configured in 2 ways:</p> <ul style="list-style-type: none"><li>■ Single-Server Messaging</li><li>■ Distributed-Server Messaging</li></ul> <p>When designing your NetMail system, you need to identify the following:</p> <ul style="list-style-type: none"><li>■ Which servers will host NetMail agents?</li><li>■ Which agents will be located on a given server?</li><li>■ Which domains will be serviced by each messaging server?</li><li>■ Does your organization need fault tolerance and scalability by deploying the same agents on multiple servers?</li></ul> <p>To install NetMail, you must meet the following system requirements:</p> <ul style="list-style-type: none"><li>■ Ensure you're running 1 of the following:<ul style="list-style-type: none"><li>■ Red Hat Linux AS 2.1</li><li>■ Red Hat Linux ES 2.1</li><li>■ SuSE 8.0</li></ul></li><li>■ Ensure eDirectory 8.7.3 or later for Linux is installed.</li><li>■ Ensure your system CPU is at least a 750 MHz Pentium III or Athlon.</li><li>■ Ensure you have at least 512 MB of system RAM.</li></ul>

---

Objective	Summary
<b>4. Install NetMail</b> (continued)	<ul style="list-style-type: none"><li>■ Make sure you have 20 MB of disk space free for installation.</li><li>■ Each server hosting a NetMail service must have a replica.</li><li>■ Make sure the eDirectory tree is synchronized and healthy.</li><li>■ Make sure you have Admin rights to the eDirectory tree.</li><li>■ Identify a name for the Messaging Server object.</li><li>■ Identify your Internet domain DNS server IP address.</li><li>■ Check for duplicate port assignments on your server.</li></ul>
<b>5. Configure and Use NetMail</b>	<p>WebAdmin is the utility used to configure the NetMail system. It is a browser-based utility that is integrated into iManager.</p> <p>To access WebAdmin directly, open a web browser and enter <code>http://your_server_IP:8018</code> or <code>https://your_server_IP:8020</code>.</p> <p>The NetMail system services all users in the containers configured in the Context property of the NMAP Agent.</p> <p>By default, 2 templates ship with NetMail:</p> <ul style="list-style-type: none"><li>■ WebAccess (Webacc.CTP)</li><li>■ WebMail (WebMail.CTP)</li></ul>



## **SECTION 9**    Unify NNLS Web Access with Virtual Office

In this section, you learn about the fundamentals of using Virtual Office to perform tasks such as creating and managing a team.

### **Objectives**

1. Describe Virtual Office
2. Install Virtual Office
3. Configure Virtual Office

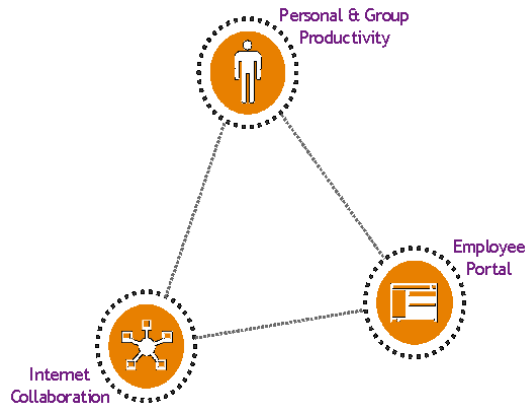
### **Introduction**

Employees in the workplace today are becoming more mobile, often telecommuting, working at a branch office, or communicating from an Internet kiosk in a public place.

In this environment, employees need access to their email and work files. They might also need to access services such as printing, chat, team calendars, and team discussions.

Novell Virtual Office helps businesses solve these problems. Through an employee portal, it enables personal and group productivity functions along with Internet collaboration abilities, as shown in the following:

**Figure 9-1**



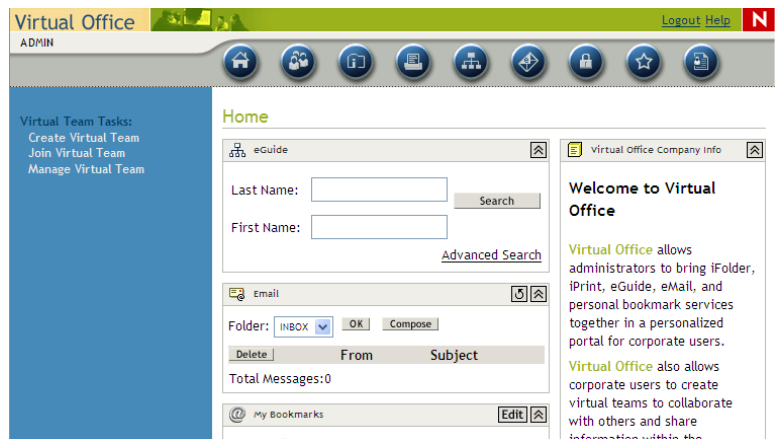
In this section, you learn how to install and configure Virtual Office to take advantage of NNLS products to make employees more productive while working remotely.

## **Objective 1    Describe Virtual Office**

Virtual Office is a web access portal that allows remote users to collaborate and share information with a workgroup team.

The following is the default Virtual Office login page:

Figure 9-2



To describe Virtual Office, you need to understand the following:

- How Virtual Office Works
- Virtual Office Sample Scenarios

### ***How Virtual Office Works***

Virtual Office optimizes the concept of self-service for users by letting them set up and manage many of their own networking, information-sharing, and data backup processes.

Virtual Office also lets users create their own functional teams, called Virtual Teams, for interactive real-time collaboration.

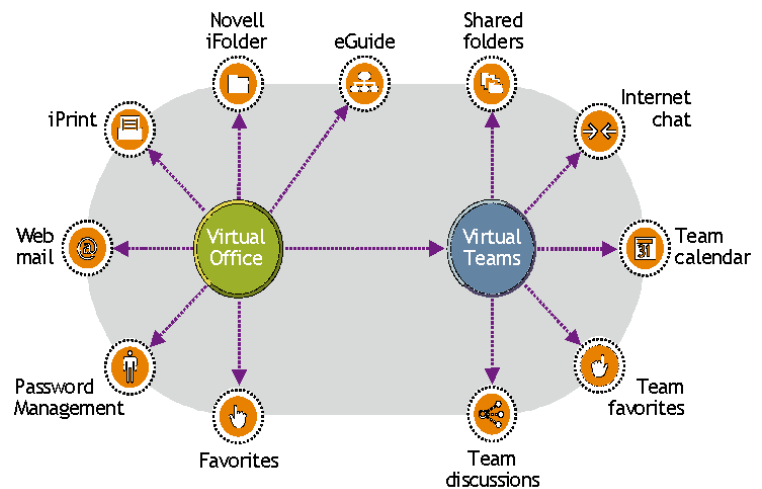
People who join a virtual team can access shared documents, discussion threads, bookmarks, and a team calendar. All members of the team have access to the team information and services.

With Virtual Office, users can

- Locate and set up printers
- Set up and maintain passwords
- Back up information
- Communicate in real time with other users and groups
- Publish a personal Web page to provide information to other users
- Access important information from any location using any web-enabled device
- Bookmark Web pages

Virtual Office provides access to the following products:

**Figure 9-3**



These products provide services that give a team leader administrative capabilities and team members the ability to effectively communicate and complete a project from a central location.

### ***Virtual Office Sample Scenarios***

The following sample implementation scenarios demonstrate how Virtual Office provides a web-based solution for team collaboration:

- Virtual Office Scenario 1: Team Collaboration
- Virtual Office Scenario 2: Individual Access

#### **Virtual Office Scenario 1: Team Collaboration**

Four employees need to collaborate on a project. They all need immediate access to the same files and they need to correspond frequently. Two of the employees are in one office and the other two reside in other locations.

Virtual Office can be used to manage the project. Initially, the project lead creates a virtual team so all team members can do the following regardless of their location:

- Chat in real time.
- Use Novell® NetStorage for immediate access to stored files.
- Use file sharing to upload or retrieve files.
- Create a Web page to post messages and other important information for all team members.
- Create bookmarks for immediate access to Web resources.

#### **Virtual Office Scenario 2: Individual Access**

An employee on her way to a meeting discovers that the battery in her laptop is drained and does not have time to retrieve a charger. Still, she needs to access some of her files, print copies of the agenda, and look at her calendar.

After arriving at the meeting, she borrows a laptop and uses Virtual Office to accomplish the following:

- Access her stored files through Novell NetStorage
- Locate a printer using iPrint and print the agenda for the meeting
- Review her email for any important messages
- Use the calendar to review a schedule of events
- Use eGuide to locate a person who is not at the meeting
- Set up a chat session with someone who is not at the meeting

## **Objective 2      Install Virtual Office**

You can install Virtual Office as an optional component when you install Novell® Nterprise™ Linux® Services (NNLS). When you select Virtual Office, the NNLS installation script installs all the components needed on your server.

To install Virtual Office on your Linux server, you need to know how to

- Meet Virtual Office Dependencies
- Gather Required Information
- Use the NNLS Install Feature
- Locate Virtual Office Files

### ***Meet Virtual Office Dependencies***

Because the Virtual Office main page provides web access to other products installed with NNLS, you need to select the following products during installation if you want to access them from Virtual Office:

- eGuide™
- iFolder™
- iPrint
- NetMail™

The Virtual Office main page displays only shortcut buttons for the products you select.

The NNLS install program selects any required components, along with their dependencies, when you select the Virtual Office component. They will all be installed in the same process.

These components include the following:

- Apache 2.0.45 on the same NNLS server
- JVM® 1.4.1\_02 on the same NNLS server
- Tomcat 4.1.24 on the same NNLS server
- eDirectory 8.7.1 or later anywhere within the network
- iManager 2.0

See Table 2-4 for information needed to successfully install any Virtual Office dependencies that are not already installed.

### ***Gather Required Information***

The following table describes the information needed to successfully install Virtual Office:

**Table 9-1**

<b>Configuration Data Required</b>	<b>Description</b>
eDirectory Server IP Address or Hostname	<p>The IP address or DNS name of the eDirectory server on which Virtual Office is installed.</p> <p>This server must have a master or read/write replica of eDirectory installed.</p>
Admin Name with Context	<p>The fully distinguished name of the Admin for the eDirectory server specified for iManager.</p> <p>The name and context must be specified using typeful syntax (<i>cn=name.ou=organizational-unit.o=organization</i>).</p>
Admin Password	The password for the Admin.
NetStorage Authentication Server	The IP address or DNS hostname of the eDirectory server to which NetStorage users authenticate using LDAP.
NetStorage Proxy User	<p>The fully distinguished name of a user object with rights to do the following:</p> <ul style="list-style-type: none"> <li>■ Search the LDAP (eDirectory) tree specified as the NetStorage Authentication Server for NetStorage users.</li> <li>■ Store the iFolder user pass phrase in eDirectory the first time a user accesses the storage location, if an iFolder storage location is defined in NetStorage.</li> </ul>



**Table 9-1** *(continued)*

<b>Configuration Data Required</b>	<b>Description</b>
NetStorage Proxy User Password	The password for the user specified as the NetStorage Proxy User.
NetStorage Users Context	The context on the NetStorage Authentication Server to be searched for NetStorage users. (All sub-contexts are also searched.)
iFolder Server IP Address or Hostname	(Optional) Specifies the IP address or hostname of the iFolder server you want created as a storage location in NetStorage. This makes iFolder automatically available to Virtual Office users.

### ***Use the NNLS Install Feature***

To install Virtual Office from NNLS, do the following:

1. Perform the steps to do a custom installation.



If necessary, see Section 2 for details on how to perform a custom installation.

2. Deselect the services you *do not want* to install, select the Virtual Office service (and any others you want to access from Virtual Office), and then continue.
3. Accept the license agreement.
4. (Conditional) If prompted for the location of the NICI Foundation Key (NFK) file, enter the path to the NFK file.

You will only be asked for the NICI Foundation Key if eDirectory has not previously been installed.

5. Enter the information requested at each prompt (see Table 9-1).
6. View the summary information and make any necessary corrections.
7. When all the information is correct, finish the installation.
8. View the readme file and save the installation settings log file.

### ***Locate Virtual Office Files***

During installation, the Virtual Office program files are copied to **/opt/novell/virtualoffice/bin**.

After installation, use the following URL in a web browser to launch Virtual Office:

**`http://server_DNS_address/vo`**

## **Objective 3      Configure Virtual Office**

After you install Virtual Office, you need to configure program settings in iManager before you can use the product.

Some Virtual Office parameters are configured from within the Virtual Office home page; others are configured in iManager.

In this objective, you learn how to do the following:

- Managing the Virtual Office Configuration in iManager
- Managing Virtual Office in the Virtual Office Home Page

### ***Managing the Virtual Office Configuration in iManager***

In iManager, you manage the following:

- Virtual Office Services Administration
- Virtual Office Environment Administration

If you install Virtual Office separately from other NNLS products, you might have to install the appropriate iManager modules in order to manage Virtual Office.

Do the following:

1. In iManager, select **Configure**.
2. Select **Modules**.
3. Select **Install**.
4. Browse to `/var/opt/novell/iManager/nps/packages` and select **VirtualOffice.npm**.
5. Select **Install**.
6. Repeat this process to install the **VirtualOfficeAdmin.npm** module.
7. Restart the **novell-tomcat4** service.

### **Virtual Office Services Administration**

In iManager, you can configure the following services:

- Company Info Service
- NetStorage
- iPrint
- eGuide
- ZENworks®
- Bookmarks

- GroupWise® Configuration
- Lotus® Notes® Configuration
- Microsoft® Exchange Configuration
- NetMail Configuration
- IMAP/POP3 Server Configuration
- Public Web Page
- Change Password

### **Company Info Service**

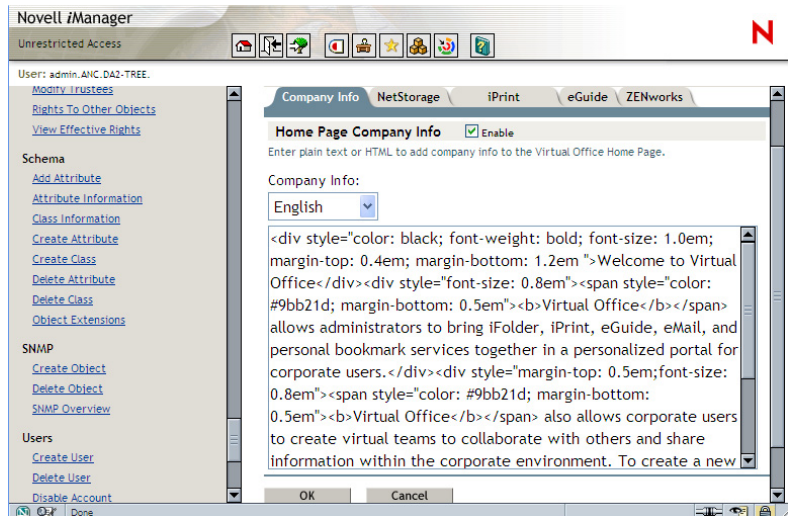
The News feature lets you post information in the Virtual Office News field on the home page.

Do the following:

1. Open iManager.
2. Select **Virtual Office Management > Services Administration > Company Info**.

The following appears:

Figure 9-4



3. Mark **Enable**.

If unchecked, the Virtual Office News field does not appear on the home page.

4. Type the **message** you want in the News field.

You can use either plain text or HTML.

5. Select **OK**.

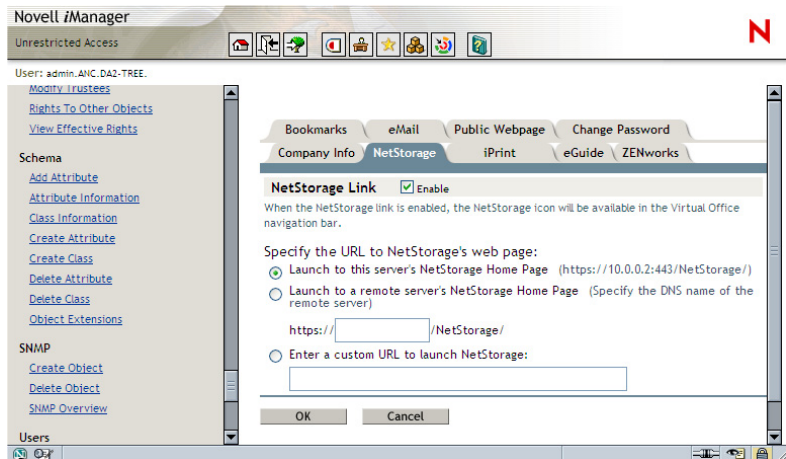
### NetStorage

The NetStorage tab lets you access Novell NetStorage, which provides simple Internet-based access to files on your server. To configure this, complete the following:

1. Open iManager.
2. Select **Virtual Office Management > Services Administration > NetStorage**.

The following appears:

Figure 9-5



3. Mark **Enable**.

If unchecked, the Files icon does not appear in Virtual Office.

4. Do one of the following to specify the **URL** to the NetStorage main page:

- ❑ If NetStorage is on the same server, select **Launch to this server's NetStorage Home Page**.
- ❑ If NetStorage is on a remote server, specify the **DNS** or **IP address** of the remote server.

For example,

**https://DNS\_or\_IP\_Address:443/NetStorage/servlet/NetStorage**

- ❑ Enter a custom **URL** to launch NetStorage.



With some browsers (including Mozilla 1.5, Internet Explorer 6.1 SP1, and Netscape 7.01 and 7.02), the URL you enter for your NetStorage Web page in the Virtual Office Services Administration plug-in is not saved.

If the URL you enter is not saved, try a different browser. Internet Explorer 6 and Netscape 7.1 are known to work.

## iPrint

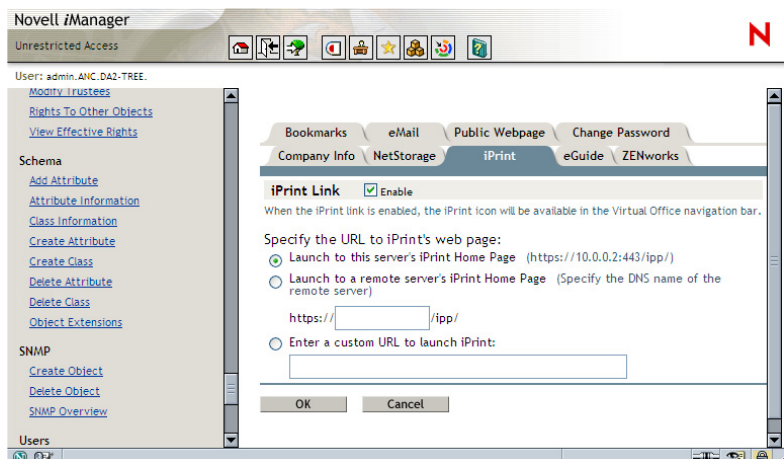
iPrint is a software solution that lets users print from anywhere to anywhere.

To configure this, do the following:

1. Open iManager.
2. Select **Virtual Office Management > Services Administration > iPrint**.

The following appears:

Figure 9-6



**3. Mark **Enable**.**

If unchecked, the iPrint icon does not appear in Virtual Office.

**4. Do one of the following to specify the *URL* to the iPrint Web site:**

- ☐ If iPrint is on the same server, click **Launch to this server's iPrint Home Page**.
- ☐ If iPrint is on a remote server, specify the *DNS* or *IP address* of the remote server.

For example,

***https://DNS\_or\_IP\_Address/iPrint/servlet/iPrint***

- ☐ Specify a custom *URL* to launch iPrint.

**5. Select **OK**.****eGuide**

Novell eGuide is a Web application that provides a browser-based search capability for users regardless of the location of your LDAP data source.

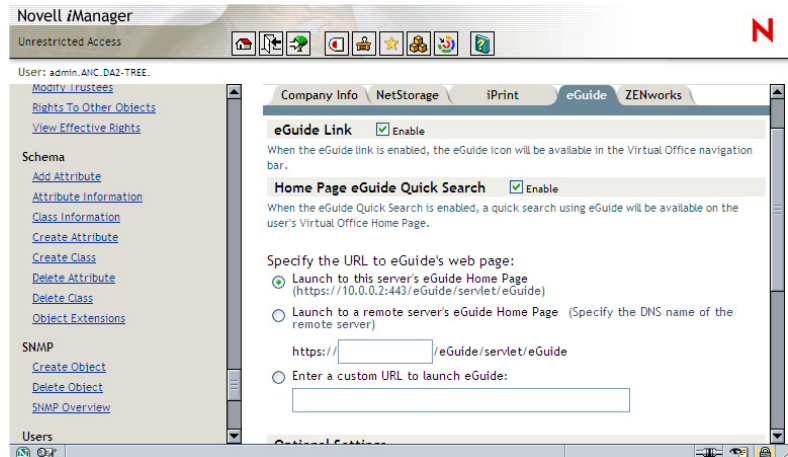
To configure eGuide, do the following:

- 1. Open iManager.**
- 2. Select **Virtual Office Management > Services Administration > eGuide**.**



The following appears:

Figure 9-7



3. Mark **Enable**.

If this box is unchecked, the eGuide icon does not appear in Virtual Office.

4. Do one of the following to specify the **URL** to the eGuide Web:

- ☐ If eGuide is on the same server, click **Launch to this server's eGuide Home Page**.
- ☐ If eGuide is on a remote server, specify the **DNS** or **IP address** of the remote server.

For example,

**https://DNS\_or\_IP\_Address/eGuide/servlet/eGuide**

- ☐ Specify a custom **URL** to launch eGuide.

5. Select **OK**.

You can also set an optional proxy URL. This allows an Internet proxy/accelerator, like Novell iChain, to correctly rewrite the specified proxy URL to the correct DNS name that will allow a user's browser to work properly through the proxy server.

## ZENworks®

ZENworks provides directory-based management of desktops, handheld devices, and servers.

To use ZENworks with Virtual Office, you must install and configure Novell ZENworks 6 Desktop Management and Web Self-Service components.



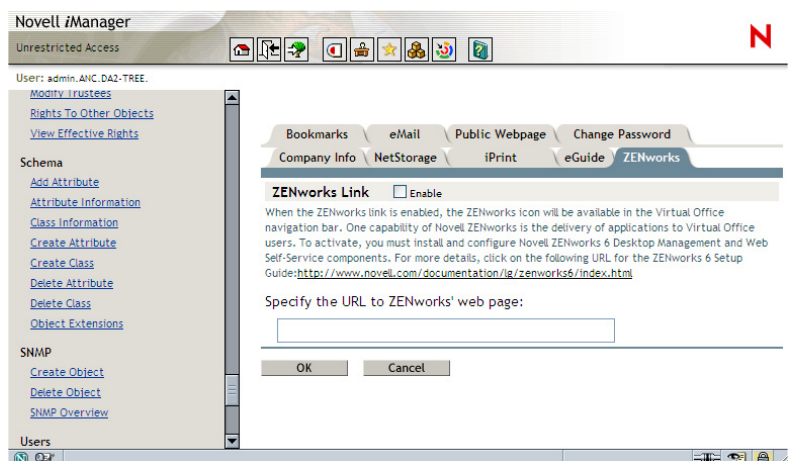
See <http://www.novell.com/documentation/lg/zenworks6/index.html> for more information.

To configure ZENworks access through Virtual Office, do the following:

1. Open iManager.
2. Select **Virtual Office Management > Services Administration > ZENworks**.

The following appears:

Figure 9-8



3. Mark **Enable**.

4. Specify the **URL** for the ZENworks Web page.
5. Select **OK**.

## Bookmarks

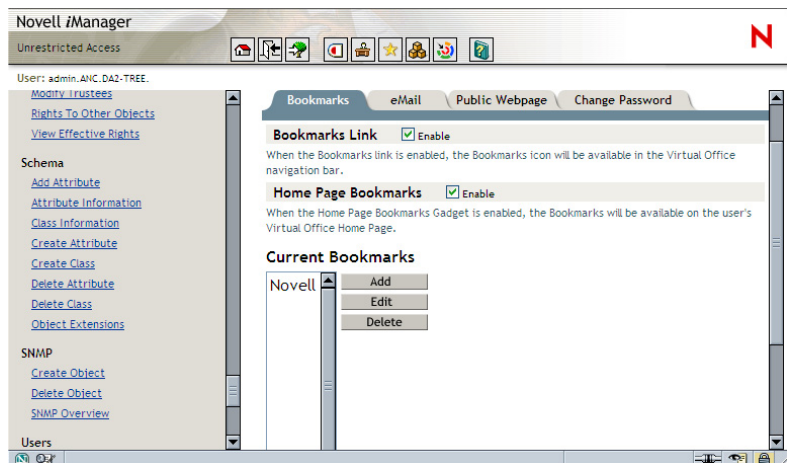
The Bookmarks tab page provides configuration options for the Virtual Office Bookmarks service.

To configure this, do the following:

1. Open iManager.
2. Select **Virtual Office Management > Services Administration > Bookmarks**.

The following appears:

Figure 9-9



3. If you want the Bookmarks button to appear in the Virtual Office button bar, to the right of the Bookmarks Link title select **Enable**.

4. If you want bookmarks to appear on user home pages, to the right of the Home Page Bookmarks title select **Enable** and do 1 or more of the following:
  - ❑ Add a bookmark by selecting **Add**; then enter a bookmark *name* and *URL* and select **OK**.
  - ❑ Edit an existing bookmark by selecting the *book mark* and selecting **Edit**; then change the *name* or *URL* of that bookmark and select **OK**.
  - ❑ Delete an existing bookmark by selecting the *bookmark*; then select **Delete**.
5. Select **OK**.

### **GroupWise® Configuration**

This parameter provides configuration settings for the Virtual Office GroupWise option.

To configure this, do the following:

1. Open iManager.
2. Select **Virtual Office Management > Services Administration > eMail**.
3. If you want the e-Mail button to appear in the Virtual Office button bar, to the right of the eMail Link title select **Enable**.
4. From the Email Server menu, select **Novell GroupWise**.
5. Select **Edit**.
6. Enter the GroupWise WebAccess *URL*.
7. If the user's credentials are the same as those used by the Virtual Office eDirectory tree, select **Synchronized with Virtual Office Tree**.
8. Select **OK**.

9. You can also configure the Home Page Reduced eMail View. When the reduced email view is enabled, the user's most recent email will be listed on the user's Virtual Office Home Page.

Do the following:

- a. Configure your GroupWise server to support POP3 or IMAP.
- b. To the right of the Home Page Reduced eMail View title select **Enable**.
- c. Select **Edit**.
- d. Select **POP3** or **IMAP**.
- e. Enter your Incoming Mail Server **DNS name** or **IP address**.
- f. Enter your SMTP Server **DNS name** or **IP address**.
- g. If the user's credentials are the same as those used by the Virtual Office eDirectory tree, select **Synchronized with Virtual Office Tree**.
- h. Select **OK**; then select **OK**.

#### **Lotus® Notes® Configuration**

This parameter provides configuration settings for the Virtual Office Lotus Notes option.

To configure this, do the following:

1. Open iManager.
2. Select **Virtual Office Management > Services Administration > eMail**.
3. If you want the e-Mail button to appear in the Virtual Office button bar, to the right of the eMail Link title select **Enable**.
4. From the E-mail Server menu, select **Lotus Notes**.
5. Select **Edit**.
6. Specify the Lotus Notes **URL**.
7. Specify the Lotus Notes **proxy address**.

8. Select **OK**.
9. You can also configure the Home Page Reduced eMail View. When the reduced email view is enabled, the user's most recent email will be listed on the user's Virtual Office Home Page.  
Do the following:
  - a. Configure your Notes server to support POP3 or IMAP.
  - b. To the right of the Home Page Reduced eMail View title select **Enable**.
  - c. Select **Edit**.
  - d. Select **POP3** or **IMAP**.
  - e. Enter your Incoming Mail Server **DNS name** or **IP address**.
  - f. Enter your SMTP Server **DNS name** or **IP address**.
  - g. If the user's credentials are the same as those used by the Virtual Office eDirectory tree, select **Synchronized with Virtual Office Tree**.
  - h. Select **OK**.
10. Select **OK**.

#### **Microsoft® Exchange Configuration**

This parameter provides configuration settings for the Virtual Office Exchange option. To configure this, complete the following:

1. Open iManager.
2. Select **Virtual Office Management > Services Administration > eMail**.
3. If you want the e-Mail button to appear in the Virtual Office button bar, to the right of the eMail Link title select **Enable**.
4. From the E-mail Server menu, select **Microsoft Exchange**.
5. Select **Edit**.
6. Specify the Microsoft Exchange **URL**.

7. Select **Synchronized with Virtual Office Tree** or **Different Than the Virtual Office Tree**, depending on where the user credentials are.
8. Select **OK**.
9. You can also configure the Home Page Reduced eMail View. When the reduced email view is enabled, the user's most recent email will be listed on the user's Virtual Office Home Page.  
Do the following:
  - a. To the right of the Next to Home Page Reduced eMail View title select **Enable**.
  - b. Select **Edit**.
  - c. Select **POP3** or **IMAP**.
  - d. Enter your Incoming Mail Server **DNS name** or **IP address**.
  - e. Enter your SMTP Server **DNS name** or **IP address**.
  - f. If the user's credentials are the same as those used by the Virtual Office eDirectory tree, select **Synchronized with Virtual Office Tree**.
  - g. Select **OK**.
10. Select **OK**.

#### **NetMail Configuration**

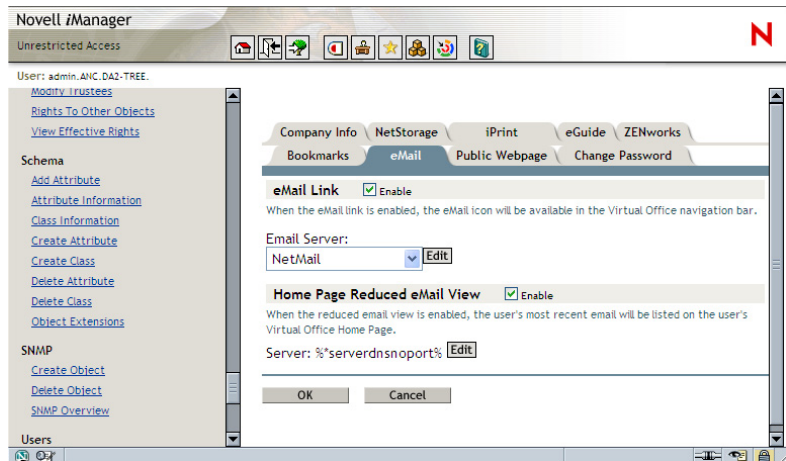
This parameter provides configuration settings for the Virtual Office NetMail option.

Do the following:

1. Open iManager.
2. Select **Virtual Office Management > Services Administration > eMail**.

The following appears:

**Figure 9-10**



3. If you want the e-Mail button to appear in the Virtual Office button bar, to the right of the eMail Link title select **Enable**.
4. From the E-mail Server menu select **NetMail**.
5. Select **Edit**.
6. Specify the NetMail URL.
7. Select **Synchronized with Virtual Office Tree** or **Different Than the Virtual Office Tree**, depending on where the user credentials are.
8. Select **OK**.
9. You can also configure the Home Page Reduced eMail View. When the reduced email view is enabled, the user's most recent email will be listed on the user's Virtual Office Home Page.

Do the following:

- a. To the right of the Home Page Reduced eMail View title select **Enable**.
- b. Select **Edit**.



- c. Select **POP3** or **IMAP**.
- d. Enter your Incoming Mail Server **DNS name** or **IP address**.
- e. Enter your SMTP Server **DNS name** or **IP address**.
- f. If the user's credentials are the same as those used by the Virtual Office eDirectory tree, select **Synchronized with Virtual Office Tree**.
- g. Select **OK**; then select **OK**.

10. Select **OK**.

### **IMAP/POP3 Server Configuration**

To configure Virtual Office to work with a remote IMAP/POP3 mail server, do the following:

- 1. Open iManager.
- 2. On the iManager main page, select **Virtual Office Management > Services Administration > eMail**.
- 3. Select **Enable**.
- 4. From the E-mail Server menu, select **IMAP/POP3 Server**.
- 5. Select **Edit**.
- 6. Select the mail server **type** you want (IMAP or POP3).
- 7. Specify the **incoming mail server DNS name**.
- 8. Specify the **SMTP Server DNS name**.
- 9. Select **Synchronized with Virtual Office Tree** or **Different Than the Virtual Office Tree**, depending on where the user credentials are.
- 10. Select **OK**.
- 11. You can also configure the Home Page Reduced eMail View. When the reduced email view is enabled, the user's most recent email will be listed on the user's Virtual Office Home Page.

Do the following:

- a. To the right of the Home Page Reduced eMail View title select **Enable**.
- b. Select **Edit**.
- c. Select **POP3** or **IMAP**.
- d. Enter your Incoming Mail Server **DNS name** or **IP address**.
- e. Enter your SMTP Server **DNS name** or **IP address**.
- f. If the user's credentials are the same as those used by the Virtual Office eDirectory tree, select **Synchronized with Virtual Office Tree**.
- g. Select **OK**.

**12.** Select **OK**.

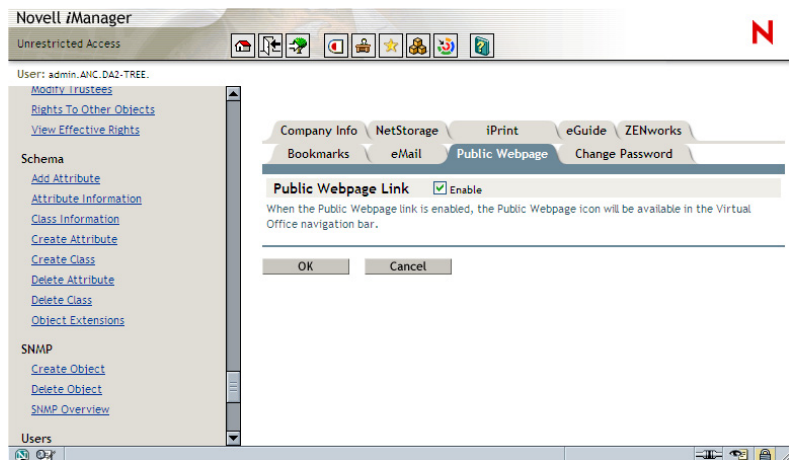
### **Public Web Page**

This parameter provides configuration options for the Virtual Office Public Web Page service. To configure this, do the following:

1. Open iManager.
2. Select **Virtual Office Management > Services Administration > Public Webpage**.

The following appears:

**Figure 9-11**



3. If you want the Public Webpage link to appear in the Virtual Office navigation bar, to the right of the Public Webpage link select **Enable**.
4. Select **OK**.

### Change Password

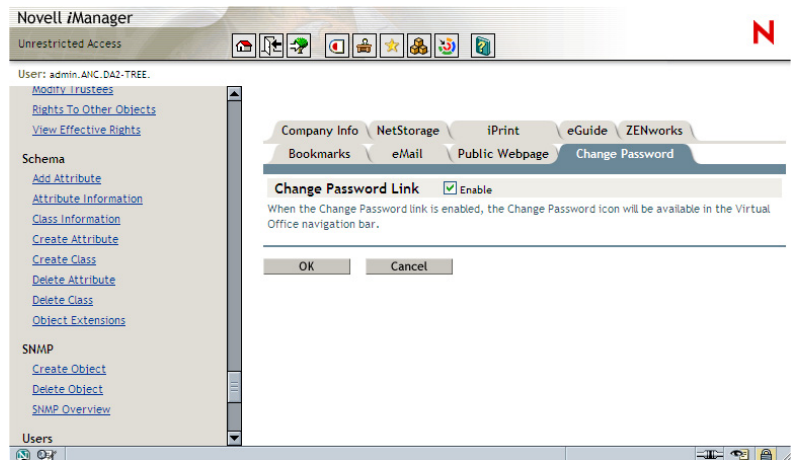
Point out that changing the password here changes the eDirectory password. This, of course, changes the password for all other NNLS services.

This parameter specifies whether users are allowed to change their eDirectory passwords. To configure this, do the following:

1. Open iManager.
2. Select **Virtual Office Management > Services Administration > Change Password**.

The following appears:

**Figure 9-12**



3. If you want users to be able to change their Virtual Office password, to the right of the Change Password Link title select **Enable**.

If enabled, the Change Password button appears in the Virtual Office button bar. If Change Password is not enabled, users cannot change their Virtual Office password.

4. Select **OK**.

### Virtual Office Environment Administration

In iManager, you can configure the following Virtual Office environment parameters:

- Team Configuration
- Logging

## Team Configuration

This parameter provides configuration options for the Virtual Teams. A *virtual team* is a central location in Virtual Office where users can exchange information, share files, and maintain a calendar of events.

Virtual Office lets you create your own teams and become members of other teams. For example, you might create a community for a Human Resources group. All information and files shared through that community can be directly related to human resource tasks.

When you create a virtual team, you become both the team owner and a team member. Virtual teams can have multiple owners. If you want to grant another user administration rights to your team, you must make that user an owner.

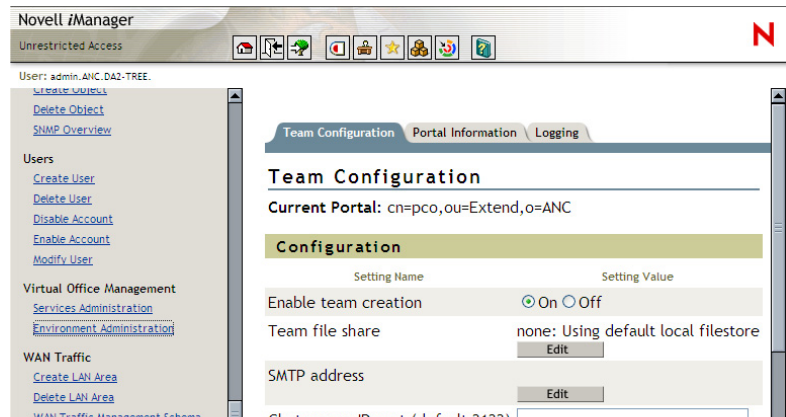
Owners have equal rights. An owner can remove other owners from the community—even the individual who created it. All teams are visible in the Virtual Teams list, but access to these teams is available only to team members.

To configure teams, do the following:

1. Open iManager.
2. Select **Virtual Office Management > Environment Administration > Team Configuration**.

The following appears:

Figure 9-13



3. Enter the following settings:

- ❑ **Enable Team Creation:** Select **On** to let users create teams.  
This setting is turned on by default.
- ❑ **Team File Share:** Specify the *path* to the file-sharing location.
- ❑ **SMTP Address:** Specify the address for e-mail notifications.
- ❑ **Chat Server IP Port:** Specify the port for applet-to-server communication.
- ❑ **Manage Team Access:** This option lets you deny a user the ability to create a virtual team. Select **Edit > Search**, search for and select a *user*, and then select **Select**.

4. Select **Save**.

## Logging

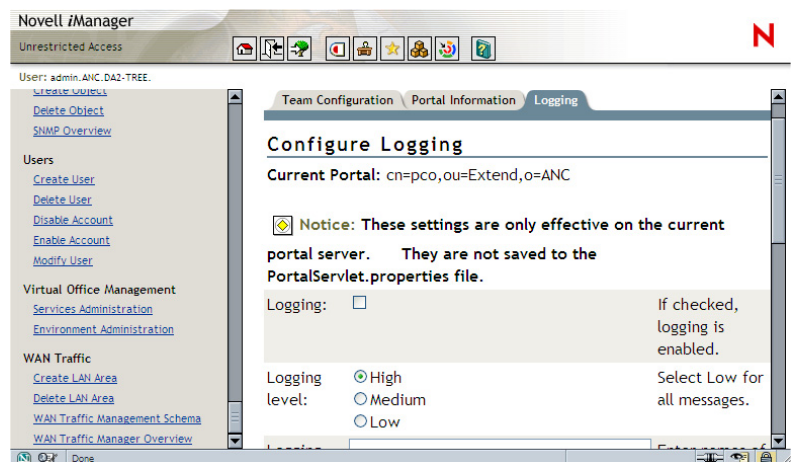
This parameter determines the amount of information that is recorded in Virtual office logs. These settings are only effective on the current portal server. They are not saved to the PortalServlet.properties file.

To configure this parameter, do the following:

1. Open iManager.
2. Select **Virtual Office Management > Environment Administration > Logging**.

The following appears:

Figure 9-14



3. Configure the following settings:
  - ❑ **Logging:** Select the box next to Logging to enable logging.
  - ❑ **Logging Level:** Specifies the amount of information to include in logs:
    - ❑ **High:** Logs specific information.
    - ❑ **Medium:** Logs specific and some general messages.
    - ❑ **Low:** Logs all messages.
  - ❑ **Logging Modules:** Lists the modules that are included in the logging. If the field is blank, the logging includes all modules.
  - ❑ **Logging to Standard Error:** Enables logging to standard error.
  - ❑ **Logging to Standard Out:** Enables logging to standard out.
  - ❑ **Logging to File:** Sends the logging report to the `/var/opt/novell/iManager/nps/WEB-INF/debug.xml` file. Select View All to view the messages in that file. Select Clear All to clear the file.
4. Select **OK**.

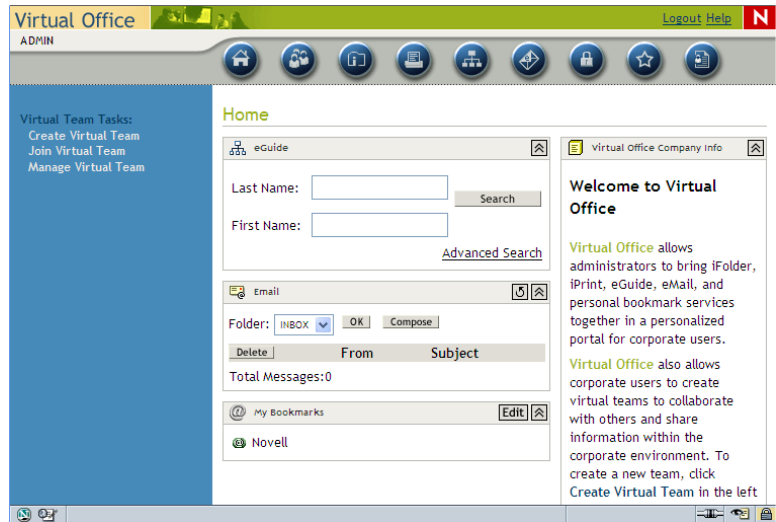
### ***Managing Virtual Office in the Virtual Office Home Page***

You can configure many of the Virtual Office services to meet your requirements using the Virtual Office home page. To open the virtual office home page, open a browser window and enter **`http://server_IP_or_DNS/vo`**.



The following appears:

**Figure 9-15**



You configure the following services from this location:

- Bookmarks
- Change Password
- Public Web Pages
- Virtual Teams
- Virtual Team Services

## Bookmarks

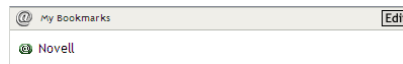
Virtual Office lets you create and maintain Web page bookmarks for immediate access to Web sites.

Do the following:

1. From the button bar on the Virtual Office main page, select **View and Manage my Bookmarks**.

The following appears:

**Figure 9-16**



2. Select **Edit**; then select **Add**.
3. Enter a *name* for the Web site; then enter the site's *URL*.
4. Select **OK**.
5. Select the number of *columns* you want your bookmarks to be displayed in.
6. Select **Save**.

## Change Password

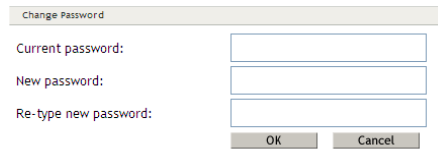
This feature lets users change their eDirectory passwords.

Do the following:

1. From the button bar on the Virtual Office main page, select **Change My Password**.

The following appears:

**Figure 9-17**

A screenshot of a web-based 'Change Password' dialog box. The dialog has a title bar that says 'Change Password'. Inside, there are three text input fields labeled 'Current password:', 'New password:', and 'Re-type new password:'. Below the fields are two buttons: 'OK' and 'Cancel'.

2. Enter your current *password*.
3. Enter your new *password*; then re-enter your new *password*.
4. Select **OK**.

## Public Web Pages

A public Web page is a personal page that users create in Virtual Office. Users can create these Web pages to display information, bookmarks, and files for other users.

For example, a user might have a document file that several other users need at some point. This file can be placed on a personal Web page so other users can view or download it from there.

When you create Web pages, you can display or hide any of the options available in the configuration wizard.

To configure your personal Web page, do the following:

1. From the button bar on the Virtual Office main page, select **View and Edit My Webpage**.
2. Select **Edit**.

The following appears:

Figure 9-18

Virtual Office

Public Page

User:admin

**Publish Details (checked)**

☒ User Information

☒ Common name: admin

☒ Team Member

☒ Published Favorites Edit

☒ @ Novell

☒ Published Files Edit

OK Cancel

3. Select the check box for each of the following items you want to display:
  - ☐ **User Information:** Selects everything in the User Information section.
  - ☐ **Common Name:** Displays the user's common name.
  - ☐ **Team Member:** Makes the site available for display for all team members.
  - ☐ **Published Favorites:** Displays the user's bookmarks.
  - ☐ **Published Files:** Shows the files the user has downloaded.
4. Select **OK**.

All users can search for and access Web pages that are made public. This is helpful if you need contact information or if you want to access a file a user has downloaded and made available.

## **Virtual Teams**

To configure and use virtual teams, you need to understand the following:

- Creating a Virtual Team
- Requesting Team Membership
- Performing Virtual Team Management Tasks

### **Creating a Virtual Team**

You can create protected virtual teams. This means that all teams are visible in the Virtual Teams list, but access to these teams is available to only members.

To create a virtual team, do the following:

1. On the Virtual Office main page, select **Create Virtual Team**.

The following appears:

Figure 9-19

Virtual Office

Logout Help

ADMIN

Virtual Team Tasks:  
Create Virtual Team  
Join Virtual Team  
Manage Virtual Team

**New Virtual Team**

Use this page to create virtual teams.

Name:

Description:

Create

2. Enter the team *name*.
3. (Optional) Enter a *description*.
4. Select **Create**.
5. When prompted that the team has been created, select **OK**.

### Requesting Team Membership

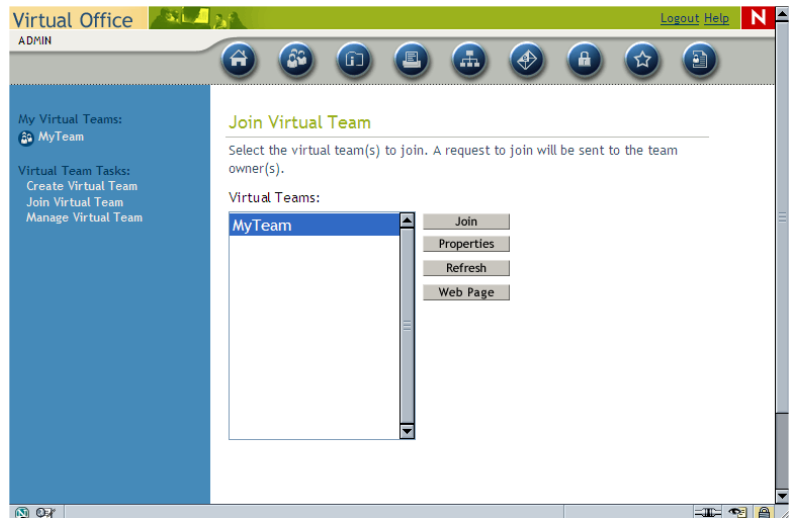
All users can request membership to virtual teams. You must be a member of a team to have access to information and services in that team.

To request membership to a virtual team, do the following:

1. On the Virtual Office main page, select **Join a Virtual Team**.

The following appears:

Figure 9-20



2. Select the team you want to join.
3. Select **Join**.

Because Virtual Team access is restricted to members, you must request membership from the owner of the team. This screen lets you request a virtual team membership.

After the owner approves your request, you become a member of the team.

4. Select **Request > OK**.

#### Performing Virtual Team Management Tasks

Management tasks (except for removing your own membership from a team) are restricted to the team owner.

To administer a virtual team, you need to know how to do the following:

- Show Team Members
- Invite Users to Join a Team
- Approve or Deny a Membership Request
- Add Team Owners
- Block Users from a Team
- Edit Team Properties
- Set Notify Preferences
- Delete a Virtual Team

#### **Show Team Members**

You might want to view a list of all the members of your team to ensure that it includes all the users you want as members.

To show team membership, do the following:

1. On the Virtual Office main page, open your *team*.
2. In the Team Membership column, select **Show Team Members**.

#### **Invite Users to Join a Team**

After you create a team, you can invite other users to become members of that team.

When you invite a user to join a virtual team, that user has the option to accept or reject the invitation.

To invite users to join a team, do the following:

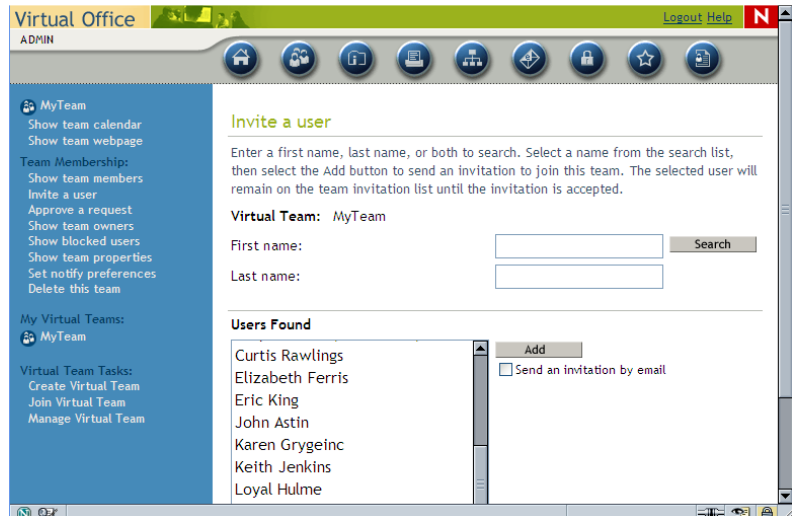
1. On the Virtual Office main page, open your team.
2. In the Team Membership column, select **Invite a User**.



3. Enter the **name** of the user you want to add; then select **Search**. If you want to see all users, leave these fields blank and select **Search**.

The following appears.

Figure 9-21



4. Select the desired **users**.
5. (Optional) Select **Send an invitation by Email**.
6. Select **Add**.

#### Approve or Deny a Membership Request

Virtual Office notifies you when you are invited to join a virtual team. Unless you are assigned to the team, you have the option to accept or reject the invitation.

To accept or reject a membership request, do the following:

1. On the Virtual Office main page, open your team.
2. In the Team Membership column, select **Approve a Request**.

The following appears:

Figure 9-22



3. Select the request; then select **Approve** or **Deny**.

#### Add Team Owners

Virtual Office lets you grant ownership to other users. For example, you might want to delegate some of the team management tasks to someone else.

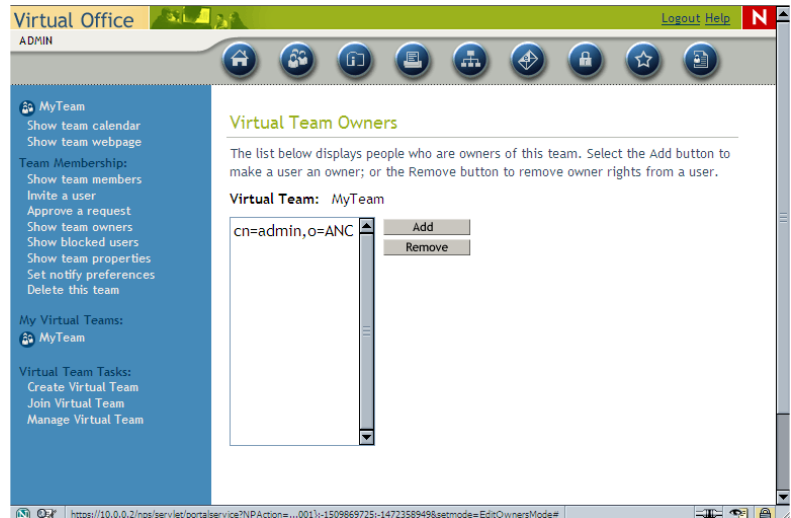
All team owners have the same team management rights.

To add team owners, do the following:

1. On the Virtual Office main page, open your team.
2. In the Team Membership column, select **Show Team Owners**.

The following appears:

Figure 9-23



3. Select **Add**.
4. Enter the **name** of the user you want to add; then select **Search**.  
If you want to see all users, leave these fields blank and select **Search**.
5. Select the **name** of the user you want to add as a team owner; then select **Add**.

### Block Users from a Team

Virtual Office lets team owners prevent users from accessing a team.

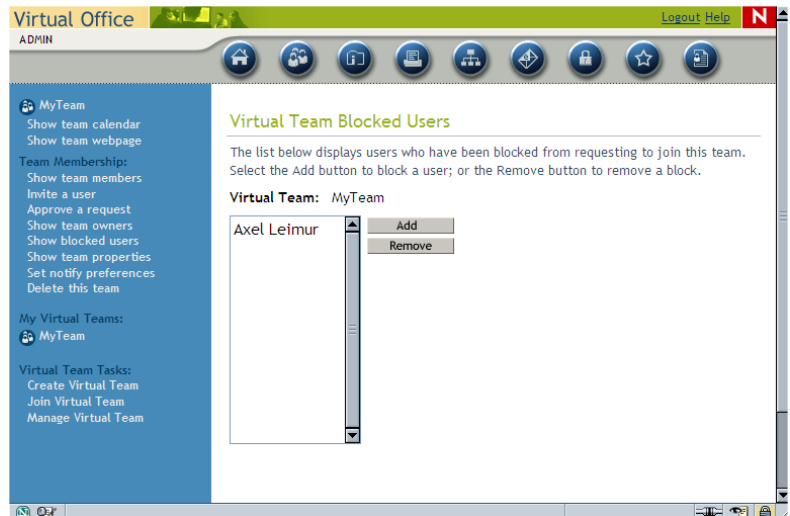
For example, you might create a virtual team for a specific department that has some temporary employees who you do not want accessing the shared files.

To block a user, do the following:

1. On the Virtual Office main page, open your team.
2. In the Team Membership column, select **Show Blocked Users**.

The following appears:

Figure 9-24



3. Select **Add**.
4. Enter the **name** of the user you want to block; then select **Search**.  
If you want to see all users, leave these fields blank and select **Search**.
5. Select the **users** you want to block; then select **Add**.

### Edit Team Properties

After you set up and configure a virtual team, you can modify your property settings to reflect any changes or updates. Team properties include a list of team members and the components they can access.

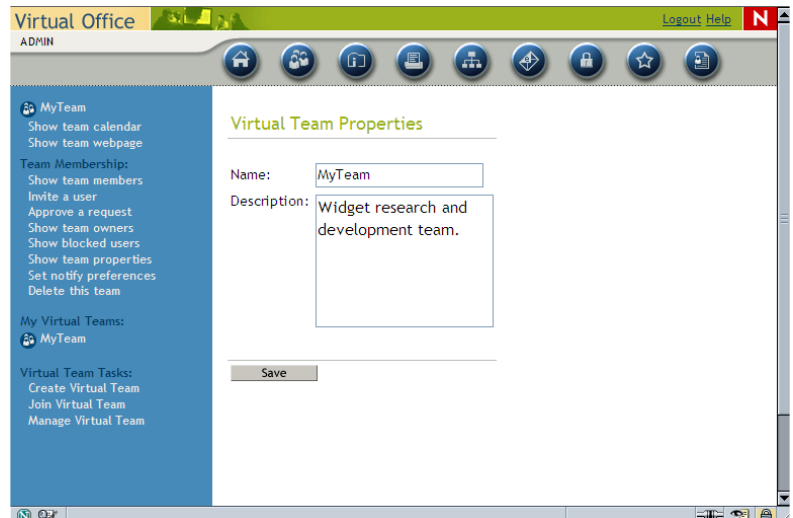
For example, you might not use the Chat feature so you can remove it from the page.

To edit team properties, do the following:

1. On the Virtual Office main page, open your team.
2. In the Team Membership column, select **Show Team Properties**.

The following appears:

Figure 9-25



3. Edit the *name* or *description* of the team.
4. Select **Save**.

## Set Notify Preferences

As you manage a virtual team, you might need to do some of the following tasks:

- Post discussions to communicate with members
- Post event notices
- Add files to share with members

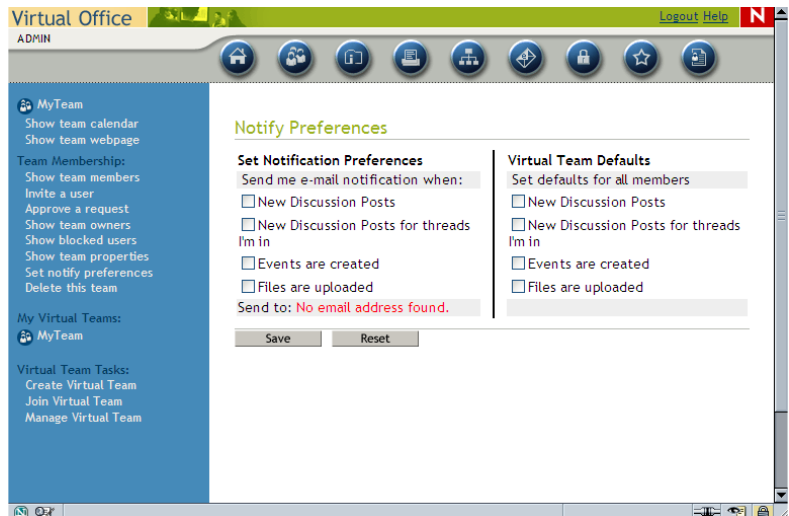
You can notify team members through e-mail when you do any of these tasks.

To set the notify preferences, do the following:

1. On the Virtual Office main page, open your *team*.
2. In the Team Membership column, select **Set Notify Preferences**.

The following appears:

Figure 9-26



3. Select each of the following items you want to notify team members about:
  - ❑ **New Discussion Posts.** Notifies team members when the owner posts a new message in the Discussion service.
  - ❑ **New Discussion Posts for Threads I'm In.** Notifies team members when someone responds to the discussion message. A notification is sent for every response to a message.
  - ❑ **Events Are Created.** Notifies team members when a new event is created.
  - ❑ **Files Are Uploaded.** Notifies team members when a file is uploaded in the File service.
  - ❑ **Sent To: Team member's e-mail address.** This is the address that all notifications are sent to.
4. Select **Save**.

#### **Delete a Virtual Team**

If you are a team owner, you can delete the team you own.

For example, you might create a team for a specific project. When that project has been completed, you can delete the team.

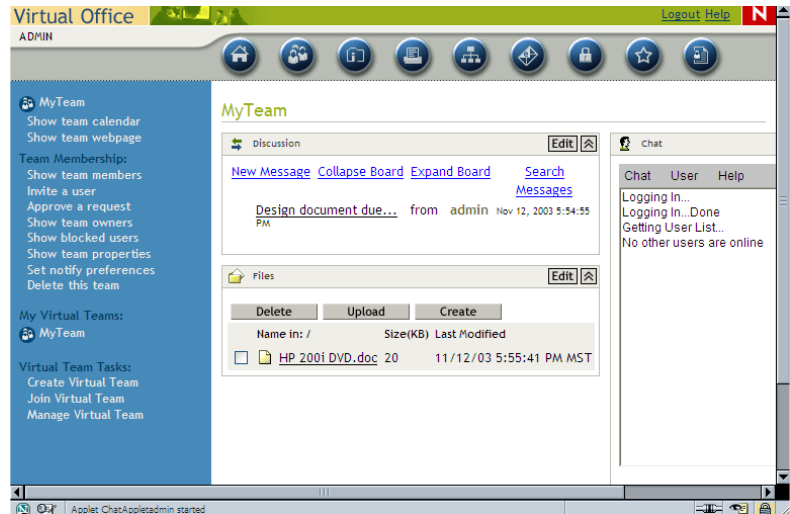
To delete a virtual team, do the following:

1. On the Virtual Office main page, open your team.
2. In the Team Membership column, select **Delete this Team**.
3. Select **Delete**.

## Virtual Team Services

On the team home page, you can access the virtual team services, as shown in the following:

Figure 9-27



The following are services that are available only in a virtual team setting:

- **Discussion.** This service lets users in a team participate in online discussions and exchange messages.
- **Calendar.** This service lets you schedule events and appointments and share this information with team members.



- **Files.** This service is a file-sharing tool that is available for members of a virtual team. It lets you do the following tasks:
  - Browse directories
  - Create directories in the current path or directory
  - Upload files
  - Remove files
  - Share files with other users on a team
- **Chat.** This service lets members of a virtual team communicate through instant messaging. You can do the following with the Chat service:
  - Chat with other users
  - Save or print conversations
  - Invite users to join a chat session
  - Turn sounds on or off
  - Indicate that you are away from your workstation
- **Links.** This service lets you create and display links to Web pages.

**35 Minutes**

### ***Exercise 9-1    Configure and Use Virtual Office***

As network administrator for your Digital Airlines office, you are setting up a virtual team using Virtual Office for an operational efficiency research project.

The team is composed of pilots, ground crew, marketing specialists, customer service personnel, and management.

Do the following:

- Part I: Set Up an Efficiency Project Virtual Team
- Part II: Add a Calendar Event and a Published Favorite
- Part III: Add Users to a Virtual Team
- Part IV: Upload a File for the Team
- Part V: Create a Reminder Message for the Team Meeting

#### **Part I: Set Up an Efficiency Project Virtual Team**

Do the following:

1. From your NNLS server, access Virtual Office by entering the following URL:  
**`http://DAX.your_container.digitalairlines.com/vo`**
2. Log in to Virtual Office as **srife** with a password of **novell**.
3. On the left, select **Create Virtual Team**.
4. In the Name field, enter **Efficiency Project**.
5. Select **Create**.
6. When prompted that the team has been created, select **OK**.
7. On the left, select **Efficiency Project**.

A Default Plugin dialog appears indicating that Chat area on the Efficiency Project page can only be viewed with the appropriate plug-in.

Not all java applets in Virtual Office currently run in Mozilla 1.5 (such as Chat). Even downloading the requested plug-in might not work.

However, the Chat applet does work in Internet Explorer 6 or later.

If you want to avoid the Default Plugin dialog appearing each time you return to the Efficiency Project page, complete the rest of the exercise on the Windows XP workstation.

8. Close the dialog by selecting **CANCEL**.
9. Note the following new items on the screen:
  - ❑ Discussion area for ongoing, forum-like communications among team members
  - ❑ Files section for team-specific items in a central repository
  - ❑ Chat in real-time with any logged-in team member(s)
  - ❑ An expanded menu on the left

## **Part II: Add a Calendar Event and a Published Favorite**

You need to schedule a team meeting for tomorrow at 8:00 am in room 201 of Building A.

Do the following:

1. On the left under Efficiency Project, select **Show team calendar**.  
A calendar appears.
2. On the right under Events, select **New**.  
A New Event window appears.

3. Fill in or select the following:
  - ❑ Subject: **Team Meeting**
  - ❑ Date: *tomorrow's date*
  - ❑ Time: **8:00 A.M.**
  - ❑ Location: **Room 201 of Building A**
  - ❑ Message: **This is our kickoff meeting.**
4. When you finish, select **Include time**; then select **Notify All Members**.
5. Select **Save**.

An Event Created message appears.
6. Select **Close**.

A new event appears for your team meeting.
7. On the left under **Efficiency Project**, select **Show team webpage**.
8. At the right of the Team Page heading, select **Edit**.
9. At the right of Published Favorites, select **Edit**.

A Current Bookmarks window appears.
10. Select **Add**.
11. In the Name field, enter **NNLS**.
12. In the URL field, enter **<http://www.novell.com/products/linux>**; then select **OK**.
13. Select **Save**.
14. Close the window listing the bookmark you just added.
15. On the right under Published Favorites select **NNLS**.

The NNLS home page appears.

### Part III: Add Users to a Virtual Team

You now need to add the project team to the virtual team.

Do the following:

1. On the left under **Team Membership**, select **Invite a user**; then on the right select **Add**.
2. Select **Search**.
3. Hold down the **Ctrl** key and select the following users:
  - ☐ Aaron Gresko
  - ☐ Bruce Richardson
  - ☐ Bryant Bell
  - ☐ Chris Grayson
  - ☐ Jennifer Elison
  - ☐ Jessica Tracy
  - ☐ Kurt Fullmer
4. Select **Add**.

The users are added to the Virtual Team: Efficiency Project list.

5. In the upper right corner of the Virtual Office window, select **Logout**.
6. Log in as **cgrayson** with a password of **novell**.
7. On the left select **Manage Virtual Team**.
8. On the right in the Virtual Team Inbox select **Efficiency Project**; then select **Join**.
9. When prompted that you have successfully joined, on the left select **Efficiency Project**.
10. Select **Show team calendar** and read the Team Meeting notification.

#### Part IV: Upload a File for the Team

Do the following:

1. Select the **Logout** link.
2. Using KWrite, create a text file in **/home/student** called **agenda.txt**.
3. Log in to Virtual Office as **srife** (team owner).  
You must be logged in as the team owner to upload files for the team.
4. On the left, select **Efficiency Project**.
5. On the right under **Files**, select **Upload**.
6. Select **Browse**.
7. Browse to and select **/home/student/agenda.txt**; then select **Open**.
8. At the bottom of the window select **Notify All Members**; then select **Upload**.
9. Select **Close**.  
The screen refreshes with agenda.txt displayed as an available file.
10. Select the **Logout** link.
11. Log in as **cgrayson**.
12. On the left, select **Efficiency Project**.

Notice that agenda.txt is available for Chris Grayson to download.

**Part V: Create a Reminder Message for the Team Meeting**

Do the following:

1. Select the **Logout** link.
2. Log in as **srife** (team owner).
3. On the left, select **Efficiency Project**.
4. On the right under **Discussion**, select **New Message**.
5. In the Subject field, enter **Team Meeting Reminder**.
6. In the message field, enter **Don't forget the team meeting tomorrow**.
7. Mark **Notify All Members**; then select **Post**.
8. Select the **Logout** link.
9. Log in as **cgrayson**.
10. On the left, select the **Efficiency Project** in the left frame.
11. On the right under Discussion, select the **Team Meeting Reminder** message.
12. Try using other features of Virtual Office.
13. When you finish, close the web browser.

*(End of Exercise)*

## Summary

Objective	Summary
1. Describe Virtual Office	<p>Virtual Office is a web access portal that allows remote users to collaborate and share information with a workgroup team.</p> <p>Virtual Office optimizes the concept of self-service for users by letting them set up and manage many of their own networking, information-sharing, and data backup processes.</p> <p>Virtual Office also lets users create their own functional teams, called Virtual Teams, for interactive real-time collaboration.</p> <p>People who join a virtual team can access shared documents, discussion threads, bookmarks, and a team calendar. All members of the team have access to the team information and services.</p>

---



Objective	Summary
1. Describe Virtual Office (continued)	With Virtual Office, users can <ul style="list-style-type: none"><li>■ Locate and set up printers</li><li>■ Set up and maintain passwords</li><li>■ Back up information</li><li>■ Communicate in real time with other users and groups</li><li>■ Publish a personal Web page to provide information to other users</li><li>■ Access important information from any location using any web-enabled device</li><li>■ Bookmark Web pages</li></ul>

---

Objective	Summary
<b>2.</b> Install Virtual Office	<p>You can install Virtual Office as an optional component when you install Novell Nterprise Linux Services (NNLS). When you select Virtual Office, the NNLS installation script installs all the components needed on your server.</p> <p>Because the Virtual Office main page provides web access to other products installed with NNLS, you need to select the following products during installation if you want to access them from Virtual Office:</p> <ul style="list-style-type: none"><li>■ eGuide</li><li>■ iFolder</li><li>■ iPrint</li><li>■ NetMail</li></ul> <p>The Virtual Office main page displays only shortcut buttons for the products you select.</p>

---

Objective	Summary
3. Configure Virtual Office	<p>In iManager, you can configure the following services:</p> <ul style="list-style-type: none"><li>■ Company Info Service</li><li>■ NetStorage</li><li>■ iPrint</li><li>■ eGuide</li><li>■ ZENworks</li><li>■ Bookmarks</li><li>■ Groupwise Configuration</li><li>■ Lotus Notes Configuration</li><li>■ Microsoft Exchange Configuration</li><li>■ NetMail Configuration</li><li>■ IMAP/POP3 Server Configuration</li><li>■ Public Web Page</li><li>■ Change Password</li></ul> <p>You can configure many of the Virtual Office services using the Virtual Office home page. To open the virtual office home page, open a browser window and enter <code>http://server_IP_or_DNS/vo</code>.</p> <p>You configure the following services from this location:</p> <ul style="list-style-type: none"><li>■ Bookmarks</li><li>■ Change Password</li><li>■ Public Web Pages</li><li>■ Virtual Teams</li><li>■ Virtual Team Services</li></ul>



## SECTION 10 Prepare for the Novell CLE Practicum

Emphasize that these scenarios help students prepare for the NNLS services portion of the practicum.

The scenarios do not include Linux administrator tasks that might be included as part of testing LPI Level 1 certification objectives.

Before students start Scenario 1, you will need to provide them with a clean installation of SuSE® SLES 8.

In this section, you work through the following scenarios to help you prepare for the CLE practicum:

- Scenario 1: Install NNLS (Required)
- Scenario 2: Business Requirements Document 1
- Scenario 3: Business Requirements Document 2
- Scenario 4: Business Requirements Document 3

The initial scenario is required. You can then select one or both of the remaining scenarios (as time permits) to configure NNLS products.

Scenarios 2, 3, and 4 give you a list of business requirements you need to fulfill as network administrator for your Digital Airlines office.

While some requirements are the same for all 3 scenarios, other requirements can change the nature of how you might test or configure the NNLS services to meet the same requirements.



---

In a classroom environment, your instructor will provide a clean installation of SuSE® SLES 8 before you start Scenario 1.

---

## Scenario 1: Install NNLS (Required)

Digital Airlines is currently using eDirectory™ and other Nterprise™ services on NetWare® to deliver networking services to customers and employees.

However, with the availability of NNLS, the CTO has decided to begin migrating several Nterprise services (such as iFolder® and iPrint) to Linux servers.

You have recently received a document that outlines the business requirements for delivering Nterprise services on Linux in your office, along with a timeline for migration of these services.

To meet these requirements and timeline, you need to begin creating and testing immediately an NNLS configuration in a lab environment that meets the business requirements.

You decide to start with a single Linux server that has NNLS installed.

Do the following:

- Install Mozilla 1.5 and prepare your server for NNLS installation using the parameters assigned to you in class (***your container, 10.0.0.x, DAx***).

Follow the same instructions you followed in Sections 1 and 2.

- Install all components of NNLS using the defaults assigned to you in class (***your container, 10.0.0.x, DAx***).

Follow the same instructions you followed in Section 2.

- Import the same LDIF file into your tree that you imported in Section 3.
- Run a Health Check of your eDirectory tree to make sure that there are no problems.

## Scenario 2: Business Requirements Document 1

After installing NNLS 1.0 and importing the LDIF file, you implement and test the following business requirements in your lab environment:

- You must be able to subscribe to the 3015 channel and install any updates to NNLS.
- All man pages for all NNLS services must be accessible from a shell prompt in a terminal session window.
- You must be able to import and export CSV files to and from eDirectory and back up any CSV files in the output directory.



---

Use the same basic configuration for your Delimited Text driver that you used in Section 5.

---

To meet this requirement

- All employees in the sample.csv file on your hard drive must be imported into a **tempwork,your container** container in your eDirectory tree.
- All members of the WPUSERS group in **your container** must be exported to a **pilots.csv** file on your hard drive.
- To back up CSV files in the output directory, create a script called **backups** that creates a tarball of all CSV files currently in the output directory and it to a **/tmp/csvbackup** directory.

Make sure the /tmp/csvbackup directory has the same permissions as the /tmp directory.

- Create a cron job that executes the backups script once a week on Friday at 5:00pm.

- All employees in your Digital Airlines office must be able to access NNLS services to perform the following tasks:
  - Use eGuide to view information about all other employees in your Digital Airlines office, and change their own employee information.
  - Install and access at least 1 high-volume printer from an iPrint map on their Windows XP workstation.



---

Use the classroom printer as the high-volume printer.

---

- Initialize an iFolder account from their Windows XP workstation.
- Map a drive from their Windows XP workstation to their home directory on the Linux NNLS server.
- Send and receive email through their own NetMail account.

## Scenario 3: Business Requirements Document 2

After installing NNLS and importing the LDIF file, you implement and test the following business requirements in your lab environment:

- The employees (users) in your eDirectory tree must be organized (stored) in departmental containers. For example, all Marketing employees must be stored in a separate container.

The departmental containers must be created under your organizational container.
- There should be one DBUSERS group that is LUM-enabled in each departmental container. All employees in the container must be members of the group. All other existing groups should be removed.



- All employees (users) in your eDirectory tree must be LUM- and Samba-enabled.
- All employees in your Digital Airlines office must be able to access NNLS services to perform the following tasks:
  - Install and access at least 1 high-volume printer from an iPrint map on their Windows® XP workstation.



---

Use the classroom printer as the high-volume printer.

---

- Initialize an iFolder account from their Windows XP workstation.
  - Map a drive from their Windows XP workstation to their home directory on the Linux® NNLS server.
  - Send and receive email through their own NetMail™ account.
- In addition, you need to provide the following for each department in your Digital Airlines office:
  - A team configured in Virtual Office. One member of each team must be configured as a team owner, with all other employees in the department as team members.
  - A NetStorage shared folder on the Linux NNLS server for the department. Folder access must be limited to department employees only.

## Scenario 4: Business Requirements Document 3

After installing NNLS 1.0 and importing the LDIF file, you implement and test the following business requirements in your lab environment:

- You must be able to subscribe to the 3015 channel and install any updates to NNLS.
- The WPUSERS group and associated members in your eDirectory tree must be synchronized to a partner office eDirectory tree and stored in **employees** and **groups** containers under a container specifically created for your office.



---

Use the same basic configuration for your eDirectory driver that you used in Section 5.

---

To meet this requirement

- All phone and fax numbers must not be synchronized to the partner office tree.
- WPUSERS in both trees must contain the same list of members when adding or deleting a member of the group.
- Any modifications to existing user information in your tree must be reflected in your partner office tree.
- The eGuide™ skin selection must be modified to reflect your local Digital Airlines office theme (something other than the default skin).
- Make Department a searchable attribute in eGuide.
- iFolder® must be configured to enforce Recover Passphrase.
- All employees in your Digital Airlines office must be able to access NNLS services to perform the following tasks:
  - Use eGuide to view information about all other employees in your Digital Airlines office, and change their own employee information.



- ❑ Install and access at least 1 high-volume printer from an iPrint map on their Windows XP workstation.

---

Use the classroom printer as the high-volume printer.

---

- ❑ Initialize an iFolder account from their Windows XP workstation.
- ❑ Map a drive from their Windows XP workstation to their home directory on the Linux NNLS server.
- ❑ Send and receive email through their own NetMail account.
- In addition, you need to provide the following for each department in your Digital Airlines office (you can view departments in the user object properties):
  - ❑ A team configured in Virtual Office. One member of each team must be configured as a team owner, with all other employees in the department as team members.
  - ❑ A NetStorage shared folder on the Linux NNLS server for the department. Folder access must be limited to department employees only.



## APPENDIX A    Directory Fundamentals

To understand the purpose and structure of a Directory, you need to know the following:

- What a Directory Is
- Challenges That a Directory Service Should Addresss
- Common Directory Service Uses
- Key Components of a Basic Directory

### ***What a Directory Is***

A Directory is a database with a compilation of services that should provide discovery, security, storage, and relationship management.

A Directory should do the following:

- **Allow disparate systems to be integrated, organized, and share common management.** These systems must communicate with each other, share information, and channel united services toward meeting the objectives of the business.
- **Enable the network to satisfy the needs of the user, organization, and business.** The network must provide unique services based on individual needs.
- **Ensure that trusted relationships are built and maintained between people, business, and the intra/internetwork.** The network must be capable of emulating all relationships that exist in a business.

- **Provide the coordination between business and network information.** It acts as the coordinator of both technical and business procedural information and as a regulator of business.

### ***Challenges That a Directory Service Should Address***

With the development of Internet and other networking technology, a new set of requirements for management, support, maintenance, and expertise must be developed.

As businesses start using technologies such as the Internet, the challenges that a Directory service should address can be classified as

- Administrative Challenges
- Business Challenges

### **Administrative Challenges**

Administrative challenges include how individuals and companies manage and store data, and how an enterprise capable of addressing the dynamic needs of users and businesses can be created.

Many system administrators manage their organization's networking infrastructure. This typically involves a single organization structure.

With evolving technology, a system administrator now becomes responsible for managing the following:

- **Single Directory.** The ability of an entire organization using multiple servers to manage a single directory.
- **Multiple Directories.** Multiple databases being supported from multiple points of administration.

- **Meta Directory.** The ability to manage and integrate information stored in multiple directories.
- **Single Identity.** A single identity is 1 directory running multiple databases. It allows for the administration and management of multiple directories from a single point and provides user access to needed resources, while providing security for those resources.
- **Multiple Identities.** Multiple identities are when a single person has accounts in multiple directories. An example of this is a business faced with the problem of managing several single identities.
- **Communities.** A group of multiple identities, single identities, or directories. The boundaries of a community are dependent upon relationships.

The following details the challenges administrators face:

**Table A-1**

Challenge	Goal	Issue
Security	Give information to customers and partners via the Internet without additional user IDs and passwords and provide methods for encryption and access control.	<ul style="list-style-type: none"> <li>■ Already too many authentication and access mechanisms</li> <li>■ Web server adds complexity</li> </ul>
Policy	Obtain technology that provides improved security, easy policy updating, and management of customers and partners.	<ul style="list-style-type: none"> <li>■ As individual departments implement policy, inability to enforce policy</li> <li>■ Causes conflicts</li> </ul>

**Table A-1** *(continued)*

Challenge	Goal	Issue
Quality of service	Ensure access to proper applications for employees and customers.	<ul style="list-style-type: none"> <li>■ Lack of common rules language prevents system from recognizing specific responses</li> </ul>
Administration	Designate a common supplier for departmental and Web servers.	<ul style="list-style-type: none"> <li>■ More platforms means high administration and management costs</li> <li>■ Might need different departmental and Web servers</li> </ul>
Personalization	Integrate customer profiles with order entry applications so that previous orders and parts are logged.	<ul style="list-style-type: none"> <li>■ No corporate standards for data retention</li> <li>■ Information is used differently for different departments</li> </ul>

Managing these challenges can be time consuming, cumbersome, and difficult.

### Business Challenges

Businesses face additional challenges in the effort to use technology successfully and efficiently.



The following describes these challenges:

**Table A-2**

<b>Business Challenges</b>	<b>Directory Solutions</b>
<p><b>Disparate systems.</b> Today, businesses face the challenge of disparate systems and various operating systems.</p> <p>Also, as companies merge and organizations change to fit the needs of a demanding marketplace, disparate systems are created.</p>	Eliminates redundancy
<p><b>Online orders.</b> E-commerce is challenging the methods in which companies identify their marketplace and relate with consumers.</p>	Provides the structure for e-commerce
<p><b>On-demand communication.</b> Organizations require access to employees, customers, and partners in a timely and effective manner.</p>	Provides email solutions
<p><b>Customer contact.</b> Businesses need to create and maintain databases of customers, inventories, and other critical data.</p>	Stores employee and customer contact lists
<p><b>File storage.</b> The storage and backup of critical data must be addressed.</p>	Provides logical pointers to company data and resources
<p><b>Security.</b> Businesses must be protected within the intranet and from the Internet. In addition, there must be a secure method for consumers and businesses to conduct business.</p>	Protects resources
<p><b>Future business issues.</b> Organizations face ever-changing interoperability issues.</p>	Provides flexibility to ensure future business solutions

### ***Common Directory Service Uses***

A full-service Directory is typically used in the following ways:

- **To organize data.** A Directory service is an organized listing of data or information.

For example, eDirectory stores information about users, servers, printers, and other network devices. This helps you perform your job better.

- **To more easily provide access to information.** A Directory service makes information about network resources available to users, devices, or applications.

A Directory service most people are familiar with is the telephone book. This provides an easy way to store, organize, and search for telephone numbers and addresses of people and businesses in your community.

Your computer also stores data in directories (or folders). The Windows® folder, for example, contains files related to the Windows operating system.

Within the Windows folder is a SYSTEM folder that contains files, such as DLLs, related to the functions of the operating system.

Businesses use Directory services to provide employees with global access to network resources.

Organizations also use Directory services to provide user authentication to network resources, and authorize them to access specific network resources and services.

Directory services also help organizations with large numbers of mobile users. In NetWare®, some applications that need access to user information use eDirectory to store this user information. These applications are called *Directory-enabled*.

A Directory service is useful to users because it provides a comprehensive view with a unified, logical list of all network resources, such as users, applications, services, system resources, and devices.

- **To provide security.** A Directory service is helpful to administrators because it
  - Identifies network resources precisely and uniquely
  - Searches for and locates network objects when required
  - Supports robust security features
  - Controls user access to network resources

This helps network administrators perform their jobs better.

- **To provide services to customers.** Hospitals, e-businesses, and various other industries are now using Directory services to provide effective services to customers.

The power of the Directory service helps businesses lay the foundation for e-business by

- Putting their multiple databases in order
- Simplifying disparate networks
- Allowing better management of processes between customers, employees, and supply-chain partners.

A Directory service offers businesses many advantages, including

- Reduced network administration and hardware costs
- Faster access to data and information
- Secure network access and superior fault tolerance

The number of Directory-based applications is rapidly increasing. Many provide crucial e-business functionality such as automated business-relationship management, supply-chain management, and electronic storefronts.

Other services provided by Directory-enabled products include automated provisioning, enhanced security, customer profiling, electronic wallets, automated notification systems, customized web interfaces, and virtual private networks (VPNs).

(VPN software is used to transfer sensitive company information across an untrusted network, such as the Internet, in a secure fashion by encapsulating and encrypting the data.)

### ***Key Components of a Basic Directory***

With the global direction of today's economy and business practices, it is logical and necessary that Directories, at least in their basic structural form, follow certain global standards.

Novell® eDirectory™, as a leading eBusiness solution, conforms to several key and vital defining components of the X.500 standard.

X.500 is an International Organization for Standardization (ISO) and International Telecommunication Union (ITU) standard that globally defines how Directories ought to be structured at the basic level.

Novell eDirectory conforms to several key and vital defining components of the X.500 standard.

To effectively understand and manage eDirectory in your network, you need to know the following:

- The History of the X.500 Directory
- X.500 Models
- The Components of the X.500 Directory

## The History of the X.500 Directory

The ITU (formerly CCITT), working with the ISO, produced the Open Systems Interconnection Reference Model, referred to as the OSI model.

Using the OSI model as a foundation, the ITU has created specifications for a series of recommendations that define Directory services.

The Directory is specified in the X.500 recommendation.

The X.500 Directory standard provides the framework for much of the current development in Directory services technology.



Although most Directories do not follow the standard completely or have expanded the specifications, understanding the X.500 Directory standard helps you assess and recommend different vendors' Directory implementations.

---

ITU is located in Geneva, Switzerland and is an international organization that cooperates with governments and private institutions to coordinate and establish global telecommunication networks and services.

ITU members represent the technical and standards bodies from members of the United Nations. ITU provides its recommendations for telecommunications and data communications through its Telecommunications Standardization Sector (ITU-TSS).

Recommendations in the X.500 series that define Directory services include

- X.501 Models
- X.509 Authentication Framework
- X.518 Procedures for Distributed Operation
- X.519 Protocol Specifications

- X.520 Selected Attribute Types
- X.521 Selected Object Classes
- X.525 Replication

### **X.500 Models**

Because of its complexity, the Directory is easier to understand if it is taken apart and described in terms of parts, or models.

Each model represents a simplified view of one part of the whole Directory.

In 1988, the X.500 specification defined only the Directory Information Model, which described a basic view of the Directory. The 1993 X.500 specification provides a number of additional models to describe the Directory.

The following are some of the most significant models in the X.500 specifications:

- **User Information Model.** Describes what the Directory looks like to the user.
- **Directory Functional Model.** Gives an overall view of how the Directory works.
- **Operational and Administrative Information Model.** Describes what the Directory looks like to an administrator.
- **DSA Information Model.** Explains how Directory System Agents (DSAs) work together to provide Directory access.
- **Directory Distribution Model.** Describes how DSAs distribute information.
- **Directory Administrative Authority Model.** Describes how the Directory is administered.
- **Security Model.** Describes authentication and access control.

Although these models are important to the X.500 specification, we will present a simple, condensed overview of the essential components of a Directory that cross the boundaries of several of these models.

### **The Components of the X.500 Directory**

Essential components of the X.500 standard include the following:

- Directory Information Database (DIB)
- Directory Information Tree (DIT)
- Directory User Agent (DUA)
- Directory System Agent (DSA)
- Directory Access Protocol (DAP)
- Directory System Protocol (DSP)
- Directory Information Shadowing Protocol (DISP)

#### **Directory Information Database (DIB)**

A Directory is made up of objects that represent physical resources in the real world. For example, people, servers, and printers are represented by objects in the Directory tree.

Collectively, these objects are known as the Directory Information Database (DIB).

Within the DIB each object is made up of a collection of information known as an *entry*. Each entry is made up of attributes and values and has a distinguished name that uniquely identifies the entry.

**Directory Information Tree (DIT)**

The Directory Information Tree (DIT) is a tree structure that logically represents and describes the collection of objects and the relationship of information in the DIB.

The objects are contained in a hierarchical arrangement in this tree structure.

For example, a person (object/entry) works for a company (object/entry) that is located within a country (object/entry).

To keep the Directory organized, a set of rules is enforced to ensure that the DIB remains stable and intact as modifications are made to it over time.

These rules are known as the Directory schema. They prevent entries from having the wrong attribute type or objects from being a member of the wrong object class.

**Directory User Agent (DUA)**

The X.500 specification takes a client/server approach in communicating information. The client interacts with a server to perform specific Directory operations.

The DUA, acting as the client, is an application process that represents each user accessing the Directory. Users are people or programs that can read, modify, or search the Directory.

The DUA requests information from the Directory and then relays that information to the user.



**Directory System Agent (DSA)**

The DSA differs from the DUA in that it is not a single protocol or piece of software.

The DSA is a collection of services and protocols that manage a specific portion of a DIB.

Communication between the DSA and the DUA goes as follows: the DSA receives a request from a DUA. If that DSA has the requested information, it will relay it back to the DUA.

If it doesn't have the requested information, it will pass the request on to another DSA.

**Directory Access Protocol (DAP)**

The DAP handles the exchange of requests and outcomes between a DUA and a DSA.

**Directory System Protocol (DSP)**

Sometimes, a DSA cannot fulfill the request of a DUA and it passes the request to another DSA. The DSP provides this communication between the 2 DSAs.

**Directory Information Shadowing Protocol (DISP)**

Replication, or shadowing, is used to distribute the DIB to another DSA. This improves the performance of requests made to the Directory and provides a secondary or backup copy of the DIB.

The DISP actually performs this exchange of replication information.



# Index

## A

ACL 81, 82, 93, 94, 95  
 address 50, 24  
 administration 12, 13, 15, 16, 18, 19, 20, 21, 22, 23, 25, 26, 27, 29, 31  
 administrator 37  
 agent 61, 10, 40, 21, 12, 13  
 Apache 18, 19, 20, 36, 38, 42, 54, 60, 45, 47, 5, 10, 18, 20, 22, 54, 66, 99, 101, 108, 10, 12, 44, 7  
 asynchronous 13, 42  
 authentication 16

## B

background 22, 18, 9, 49, 59, 65, 69, 73, 20, 33  
 backlink 51  
 bandwidth 20, 59  
 binary 25  
 bindery 48  
 block 70  
 bound 25, 34

## C

cable 71  
 Certificate Authority 80  
 CIFS 71  
 class 7, 26, 27, 38, 1, 2, 6, 16, 17, 7, 33, 34, 14, 15, 16, 17, 18, 19, 20, 19, 36, 81, 84, 93, 94, 56, 61, 33, 2, 12

client 37  
   policies 43  
 command prompt 3  
 compatibility 29  
 component 7, 16, 17, 4, 6, 8, 9, 11, 13, 14, 16, 17, 18, 20, 33, 36, 37, 40, 42, 48, 49, 54, 56, 57, 59, 60, 65, 76, 80, 1, 32, 49, 31, 32, 5, 9, 10, 11, 15, 39, 45, 46, 47, 110, 111, 8, 10, 13, 16, 18, 19, 20, 73, 76, 99, 101, 3, 4, 7, 10, 11, 12, 35, 1, 4, 5, 39, 40, 44, 53, 6, 7, 18, 44, 58, 2, 8, 11  
 compressed 24  
 concurrent 7  
 configuration 4, 9, 10, 14, 15, 16, 21, 25, 28, 32, 33, 34, 39, 43, 44, 47, 1, 2, 20, 35, 47, 53, 54, 55, 56, 57, 58, 59, 65, 72, 14, 22, 24, 26, 27, 33, 36, 45, 46, 57, 58, 60, 61, 76, 10, 15, 33, 34, 36, 49, 52, 53, 55, 66, 67, 77, 78, 4, 22, 29, 33, 34, 35, 36, 37, 52, 12, 46, 49, 54, 60, 72, 75, 76, 77, 80, 88, 89, 91, 93, 106, 112, 10, 11, 12, 17, 19, 21, 22, 24, 25, 31, 67, 68, 69, 74, 77, 78, 80, 82, 95, 96, 100, 108, 109, 110, 111, 115, 118, 5, 6, 8, 11, 13, 32, 3, 7, 8, 9, 27, 45, 50, 8, 11, 19, 20, 21, 22, 23, 25, 26, 29, 35, 59, 2, 3, 6  
 configure 8, 9, 10, 14, 15, 16, 20, 21, 22, 23, 24, 27, 28, 32, 33, 37, 38, 39, 43, 44, 46, 48, 4, 10, 15, 16, 53, 56, 57, 59, 72, 26, 43, 60, 61, 62, 1, 10, 11, 16, 34, 35, 36, 49, 51, 61, 24, 25, 28, 34, 35, 36, 37, 15, 20, 23, 27, 31, 44, 52, 59, 72, 74, 76, 79, 80, 82, 89, 91, 105, 106, 113, 15, 16, 24, 25, 31, 34, 35, 38, 39, 60,

65, 67, 72, 74, 77, 78, 80, 82, 87, 91,  
99, 108, 109, 110, 111, 113, 115, 120,  
121, 122, 1, 9, 17, 18, 19, 20, 27, 31,  
33, 35, 8, 27, 45, 47, 49, 56, 2, 10, 11,  
13, 15, 16, 18, 19, 20, 21, 22, 23, 24,  
25, 26, 27, 28, 29, 31, 32, 33, 36, 37,  
44, 50, 59, 1  
container 6, 47, 49, 52, 62, 85, 89, 91, 98,  
103, 50  
context 36, 53, 75  
create 10, 11, 25, 26, 29, 30, 40, 41, 6, 5, 7, 23,  
27, 39, 20, 23, 67, 68, 21, 23, 24, 31,  
35, 49, 77, 2, 3, 6, 7, 9, 10, 11, 12, 13,  
15, 16, 17, 18, 19, 24, 31, 38, 39, 40,  
41, 42, 43, 45, 47, 48, 6, 15, 22, 28, 34,  
37, 38, 41, 51, 52, 53, 57, 58, 59, 60,  
62, 63, 65, 66, 74, 75, 84, 85, 86, 87,  
88, 91, 96, 97, 102, 104, 112, 113, 1,  
17, 25, 29, 31, 33, 37, 43, 54, 59, 66,  
72, 73, 78, 79, 81, 82, 84, 85, 87, 88,  
89, 90, 97, 98, 103, 104, 105, 107, 110,  
111, 112, 114, 115, 116, 117, 2, 5, 6, 9,  
14, 15, 16, 17, 18, 19, 20, 29, 30, 31,  
35, 8, 11, 17, 27, 3, 5, 29, 30, 33, 35,  
37, 38, 40, 43, 47, 49, 50, 54, 55, 56, 3,  
5

## D

database 11  
debug 51, 54, 65, 68, 43, 32  
DHCP 7, 11, 15, 16, 29, 37, 44, 46, 47, 59  
directory 18, 19, 20, 24, 36, 5, 6, 7, 8, 11, 13, 14,  
17, 20, 21, 22, 24, 26, 27, 28, 29, 31,  
32, 33, 34, 35, 39, 42, 45, 46, 50, 51,  
72, 4, 5, 17, 37, 48, 55, 56, 57, 59, 60,  
61, 62, 63, 74, 1, 2, 3, 4, 5, 6, 10, 11,  
12, 28, 31, 32, 37, 41, 45, 46, 50, 51,  
53, 54, 64, 65, 80, 82, 83, 23, 24, 26,  
39, 43, 47, 51, 2, 5, 6, 8, 11, 12, 18, 19,  
20, 25, 29, 36, 39, 40, 41, 43, 45, 47,  
49, 54, 58, 68, 69, 72, 76, 77, 89, 93,  
109, 110, 111, 5, 6, 7, 9, 11, 13, 24, 33,  
34, 41, 42, 48, 54, 65, 80, 83, 88, 89,

90, 91, 92, 93, 94, 96, 98, 102, 103,  
104, 106, 107, 108, 110, 112, 114,  
115, 116, 117, 13, 20, 22, 23, 24, 25,  
34, 22, 25, 26, 27, 28, 29, 30, 31, 32,  
34, 38, 46, 54, 18, 49, 3, 4, 5, 7, 1, 2, 3,  
5, 6, 7, 8, 9, 10, 11, 12, 13

DirXML 5, 6, 13, 18, 24, 25, 28, 50, 7, 77, 23,  
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13,  
15, 16, 19, 22, 26, 29, 36, 39, 40, 41,  
42, 43, 44, 45, 46, 47, 48, 49, 52, 53,  
55, 56, 57, 58, 59, 60, 61, 62, 63, 64,  
68, 69, 70, 71, 73, 74, 75, 76, 78, 79,  
80, 81, 83, 88, 89, 90, 91, 92, 93, 97,  
99, 100, 101, 102, 103, 106, 108, 109,  
110, 111, 112, 113

distinguished name 80

DNS 4, 5, 6, 7, 11, 19, 23, 29, 37, 46, 56, 59, 66,  
14, 25, 27, 28, 30, 31, 50, 51, 52, 53,  
55, 46, 59, 60, 61, 74, 46, 75, 17, 19,  
20, 25, 33, 50, 52, 55, 57, 58, 63, 68,  
74, 81, 89, 92, 100, 103, 105, 107, 111,  
113, 116, 118, 11, 14, 16, 25, 29, 30,  
31, 24, 42, 43, 49, 56, 8, 10, 14, 16, 17,  
21, 22, 23, 25, 26, 32, 59

domain 15

download 13

driver 55, 69, 78, 100, 15

dynamic 64

## E

eDirectory 5, 22, 1, 59, 76, 25, 100, 29  
encrypted 29, 30, 26, 31, 35, 37, 9, 12, 37, 41,  
53, 65, 80, 81, 96  
encryption 41, 6  
enterprise 7, 24, 1  
entry 27  
ETC 69, 53  
export 40, 56, 41, 42, 46, 55, 57, 12, 59, 82, 3  
exporting 58, 59, 69  
external 15, 48, 66, 69, 6, 18, 28, 71, 113, 17, 52

**F**

FAT 22

file

access 103, 105, 112, 115, 117

system 3, 6, 7, 8, 9, 11, 15, 17, 19, 20, 21,  
22, 24, 26, 28, 31, 67, 69, 70, 57,  
74, 5, 18, 19, 81, 7, 47, 49, 14, 15,  
70, 82, 98, 104, 28

format 62, 11, 37, 82

**G**

generate 26, 56, 79, 58, 15, 47

global 2, 10, 7, 11, 15, 19, 21, 26, 27, 39, 40, 42,  
43, 44, 51, 53, 56, 60, 80, 120, 2, 35, 6,  
8, 9

graphical

user interface 3

group 31, 34, 88, 117

GUI 16, 34, 44, 3, 47

GUID 7, 81

**H**hardware 2, 13, 32, 42, 3, 20, 23, 55, 17, 3, 7, 3,  
7

header 57, 32

health 61, 63, 64, 65, 66, 67, 68, 70, 71, 74, 75,  
76, 78, 79, 80, 84, 2check 63, 64, 65, 66, 67, 71, 76, 78, 79, 84,  
2

hexadecimal 31

hostname 7

HTTP

port 30

**I**

identity 62

iFolder 7, 17, 19, 26, 27, 28, 31, 32, 42, 48, 51,  
53, 55, 58, 3, 46, 1, 2, 3, 4, 5, 6, 7, 8, 9,  
10, 11, 12, 13, 14, 15, 16, 17, 18, 19,  
20, 21, 22, 23, 24, 25, 26, 27, 28, 29,  
30, 31, 32, 33, 34, 35, 36, 37, 38, 39,  
40, 41, 42, 43, 44, 45, 46, 47, 48, 49,  
50, 51, 52, 53, 54, 55, 56, 57, 58, 59,  
60, 61, 62, 63, 64, 65, 66, 67, 68, 69,  
74, 94, 96, 99, 100, 101, 102, 106, 110,  
119, 120, 7, 8, 9, 58, 2, 4, 5, 6, 7iManager 18, 35, 3, 50, 11, 12, 19, 28, 29, 30,  
31, 41, 42, 52, 55, 64, 67, 68, 69, 70,  
81, 27, 31, 42, 45, 47, 54, 55, 83, 1, 2,  
3, 5, 7, 9, 10, 16, 18, 19, 21, 24, 39, 40,  
42, 43, 44, 45, 46, 47, 48, 49, 54, 12,  
16, 18, 19, 20, 22, 23, 26, 27, 29, 31,  
41, 42, 45, 52, 53, 56, 58, 59, 68, 70,  
74, 79, 80, 81, 86, 88, 98, 99, 100, 102,  
103, 104, 105, 106, 107, 23, 25, 26, 27,  
72, 79, 88, 95, 99, 103, 105, 108, 112,  
115, 117, 10, 11, 14, 15, 16, 19, 29, 30,  
31, 35, 25, 45, 56, 7, 8, 10, 11, 12, 13,  
15, 16, 18, 19, 20, 21, 22, 23, 25, 26,  
27, 28, 29, 31, 32, 59

iMonitor 60

installation 9, 14, 28, 32, 39, 43

Internet 6

Internet Printing Protocol 1

interval 75, 42

IP

address 24

IPP 9, 1, 5, 6, 13, 19, 24, 25, 28, 32, 35

iPrint 12

**K**

KMO 80

**L**

LAN 72, 9  
LBURP 42, 43, 46  
LDAP 31, 44, 81, 100, 8  
    Bulk Update/Replication Protocol 42  
    Data Interchange Format 37, 82  
LDIF 37, 38, 39, 40, 41, 43, 44, 45, 46, 47, 82,  
    61, 90, 114, 2, 3, 4, 6  
Linux 5, 10, 36, 3  
list 56, 49, 27, 28, 30  
LOAD 23, 24, 9, 15, 4, 44, 4, 7, 22  
location 6, 42  
location-based 18, 19, 20, 25, 33, 34, 35, 36  
log file 26  
logical 4, 5, 18, 80, 5, 7, 8  
login  
    script 106

**M**

Main Menu 37, 38  
management 5, 16, 2, 4, 6, 11, 12, 15, 18, 22,  
    24, 26, 27, 50, 67, 68, 69, 70, 2, 3, 4,  
    48, 54, 55, 75, 80, 83, 16, 30, 31, 32,  
    33, 35, 38, 39, 44, 47, 48, 49, 55, 1, 5,  
    7, 42, 53, 59, 63, 69, 74, 81, 88, 91,  
    101, 106, 1, 2, 5, 6, 7, 11, 12, 13, 17,  
    20, 22, 23, 25, 26, 27, 29, 30, 31, 33,  
    39, 43, 45, 46, 47, 49, 50, 51, 52, 53,  
    55, 57, 58, 59, 61, 67, 69, 72, 73, 79,  
    83, 90, 91, 2, 8, 35, 21, 25, 45, 12, 13,  
    15, 16, 18, 19, 20, 21, 22, 23, 25, 26,  
    27, 29, 31, 39, 42, 50, 1, 2, 3, 4, 7  
master 25, 30, 31, 21, 22, 23, 76, 78, 73, 11, 8  
media 69  
memory 17, 10, 11, 19, 21, 47  
Microsoft  
    Microsoft Exchange 22, 59

migrate 41, 69, 100, 101, 102  
migrating 98, 101, 102, 2  
mobile 50  
monitor 14, 32, 43, 48, 49, 72, 21, 22, 61, 63,  
    75, 57, 67  
mount  
    point 24  
mouse 16

**N**

navigation 27  
Navigator 62, 50, 98, 113, 115, 118  
NDS 41, 56, 58, 12, 33, 49, 51, 52, 53, 59, 60,  
    61, 73, 74, 76, 77, 29, 12, 20  
Netscape 15  
NetStorage 101  
network 16, 94  
    bandwidth 59  
    board 9  
    file system 7  
NFS 7, 20, 94  
NLM 33  
NMAS 49, 46  
Notes 2, 44, 10, 18, 21, 29, 21, 22, 59  
Novell  
    Novell International Cryptographic  
        Infrastructure 53  
    Novell Portal Services 23  
NSS 32

**O**

object 29, 69, 32, 47, 2, 9, 61, 65, 80, 89, 96,  
    107, 21, 22  
operating system 16  
options 43, 77

**P**

pass phrase 9, 41, 45  
 password 29, 32, 35  
 path 82, 86, 92, 117  
 physical 4, 80, 6, 22, 11  
 policies 43  
 port 21, 22, 23, 25, 26, 27, 28, 29, 30, 49, 50, 51, 52, 26, 31, 42, 46, 61, 36, 75, 88, 9, 11, 12, 17, 19, 25, 33, 52, 53, 55, 56, 75, 81, 109, 110, 8, 16, 32, 19, 26, 42, 43, 56, 30  
 port 443 17  
 port number 25  
 post-installation 24, 25  
 print  
     data encryption 6  
     driver 13  
     job 5, 7  
 printer 15, 33, 44, 48, 16, 2, 3, 4, 5, 6, 7, 9, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 24, 25, 26, 30, 31, 32, 33, 34, 35, 36, 6, 4, 5, 7  
 printing 35  
 processor 17, 43, 75, 16  
 property 14, 16, 17, 19, 32, 34, 37, 43, 45, 34, 51, 44, 55, 7, 22, 23, 26, 27, 32, 2, 3, 12, 14, 15, 17, 18, 29, 31, 38, 47, 50, 53, 61, 74, 89, 102, 104, 60, 67, 86, 88, 90, 91, 106, 32, 6, 8, 26, 45, 31, 44, 45, 7  
 protocol 8, 9, 15, 60, 9, 25, 32, 42, 54, 60, 2, 70, 85, 94, 121, 1, 6, 2, 3, 52, 13  
 PUBLIC 92, 117

**R**

read 40  
 replica 73

ring 24, 25, 68, 69  
     synchronization 8, 9, 68, 69, 76, 78, 81  
 resource 11, 68, 69, 70, 4, 80, 110, 29  
 revision 65  
 rights 47, 18  
 role 42  
 root 15, 26, 43, 56, 77, 36, 59, 88, 24, 77

**S**

secondary 28, 52, 47, 42, 43, 13  
 Secure Socket Layer 25  
 security 28, 33, 34, 35, 4, 9, 59, 2, 3, 4, 26, 29, 34, 80, 81, 25, 54, 61, 77, 80, 89, 4, 12, 29, 43, 45, 56, 81, 96, 17, 23, 2, 3, 24, 52, 1, 3, 5, 7, 8, 10  
 server 1, 2, 4, 5, 6, 7, 9, 11, 15, 16, 18, 20, 21, 22, 23, 24, 25, 27, 28, 29, 33, 36, 37, 38, 39, 45, 46, 6, 7, 15, 17, 18, 22, 26, 27, 50, 55, 56, 58, 59, 60, 61, 62, 63, 64, 65, 66, 1, 4, 7, 8, 9, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 39, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 59, 60, 61, 66, 67, 69, 70, 71, 74, 75, 76, 77, 12, 13, 14, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 30, 31, 32, 33, 34, 35, 36, 41, 42, 43, 45, 46, 48, 49, 50, 51, 52, 53, 55, 56, 59, 60, 61, 62, 66, 68, 69, 72, 73, 74, 75, 76, 77, 82, 1, 9, 10, 21, 23, 26, 29, 30, 31, 32, 33, 35, 36, 37, 43, 46, 54, 5, 39, 41, 42, 45, 52, 53, 54, 55, 58, 59, 60, 61, 73, 74, 75, 78, 80, 87, 88, 98, 99, 106, 111, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 29, 30, 31, 33, 34, 35, 36, 37, 38, 41, 42, 45, 46, 47, 48, 50, 51, 52, 53, 55, 56, 57, 58, 60, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 88, 89, 90, 92, 94, 95, 96, 97, 98, 99, 100, 101,

102, 104, 106, 107, 108, 109, 110,  
111, 112, 113, 114, 116, 118, 120,  
121, 1, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14,  
16, 17, 18, 19, 20, 22, 23, 24, 25, 28,  
29, 30, 31, 33, 34, 35, 2, 3, 4, 6, 7, 8,  
11, 13, 20, 23, 24, 25, 26, 28, 30, 39,  
40, 41, 42, 43, 45, 46, 47, 48, 49, 50,  
52, 53, 54, 55, 56, 6, 7, 8, 9, 10, 13, 14,  
16, 17, 20, 21, 22, 23, 24, 25, 26, 30,  
31, 32, 50, 58, 59, 2, 4, 5, 7, 3, 12

management 75, 23

object 21, 22

service 46, 42, 32, 9

Service Location Protocol 60, 9

set 59, 69

settings 46, 47, 48, 78, 22

setup 44

size 42

SLP 60, 61, 62, 63, 64, 79, 9, 10, 11, 12, 13, 80,  
81, 54, 108, 52

SMS 17

SMTP 19, 24, 32, 34, 39, 42, 53, 21, 22, 23, 25,  
26, 30

software 2, 10, 29, 40, 46, 2, 9, 44, 67, 71, 2, 7,  
8, 11, 13, 16, 17, 64, 65, 66, 67, 72, 73,  
81, 57, 2, 8, 10, 16, 34, 48, 70, 119,  
121, 24, 3, 6, 15, 8, 13

space 53

SSL 26, 42, 25, 33, 35, 37, 80, 9, 11, 12, 53, 56,  
75, 77, 80, 83, 96, 2, 6, 35, 3, 42

standalone 67, 6, 7, 8

start 7, 9, 12, 17, 19, 23, 24, 30, 35, 36, 38, 41,  
45, 16, 43, 45, 46, 49, 51, 55, 72, 37,  
41, 42, 45, 48, 54, 59, 63, 12, 16, 17,  
27, 28, 42, 43, 45, 47, 51, 52, 55, 74,  
83, 43, 50, 53, 52, 53, 55, 56, 59, 61,  
68, 74, 78, 79, 88, 89, 93, 99, 100, 106,  
112, 113, 23, 30, 31, 32, 35, 36, 37, 48,  
54, 66, 88, 92, 103, 105, 107, 108, 117,  
14, 15, 16, 23, 28, 29, 30, 32, 35, 42,  
43, 48, 1, 2

storage 3, 6, 31, 32, 2, 80, 2, 3, 8, 9, 16, 17, 37,  
53, 85, 94, 97, 98, 100, 101, 102, 103,  
104, 105, 106, 110, 112, 113, 114,  
115, 116, 117, 118, 8, 9, 1, 5

subcontainer 29, 60

subnet 15, 20, 33, 48, 54, 59, 60, 61, 62, 63, 64

Support Pack 6

syntax 21, 22, 23, 24, 25, 27, 28, 29, 30, 31, 46,  
19, 74, 11, 8

SYS 20, 33

system 9, 11, 13, 15, 16, 21, 22, 29, 31, 33, 34,  
40, 42, 44, 46, 2, 3, 4, 5, 6, 7, 8, 9, 10,  
11, 12, 13, 14, 15, 16, 17, 19, 20, 21,  
22, 24, 26, 28, 29, 31, 32, 35, 41, 42,  
43, 44, 45, 46, 47, 48, 49, 53, 55, 56,  
67, 68, 69, 70, 71, 72, 9, 11, 15, 16, 34,  
40, 44, 57, 74, 5, 6, 14, 18, 19, 42, 52,  
63, 78, 81, 7, 25, 32, 34, 43, 47, 2, 4, 5,  
10, 15, 21, 22, 34, 44, 49, 57, 72, 79, 4,  
5, 7, 10, 11, 14, 15, 17, 38, 41, 46, 49,  
50, 52, 56, 57, 58, 63, 64, 66, 68, 70,  
82, 87, 91, 98, 104, 116, 6, 15, 30, 31,  
34, 1, 2, 3, 4, 5, 6, 7, 8, 12, 13, 14, 15,  
16, 19, 20, 21, 22, 24, 25, 27, 28, 32,  
33, 34, 39, 40, 41, 42, 45, 46, 52, 54,  
55, 56, 2, 4, 6, 7, 10, 13

## T

target

server 14, 16, 29, 30

TID 99

time 1, 8, 12, 17, 21, 22, 23, 30, 31, 34, 41, 2,  
12, 13, 21, 53, 1, 2, 4, 6, 7, 11, 15, 16,  
20, 31, 40, 41, 43, 44, 45, 54, 58, 66,  
67, 73, 80, 8, 9, 13, 14, 15, 16, 17, 19,  
24, 31, 43, 51, 64, 65, 67, 68, 72, 77,  
78, 81, 6, 21, 22, 23, 50, 54, 7, 11, 39,  
44, 56, 59, 79, 87, 88, 107, 2, 11, 12,  
15, 29, 31, 37, 42, 44, 45, 50, 53, 54,  
57, 58, 60, 61, 62, 68, 69, 72, 79, 80,  
89, 100, 104, 107, 108, 110, 119, 27, 3,  
19, 22, 24, 28, 32, 34, 42, 43, 46, 50,



53, 3, 4, 5, 8, 51, 52, 56, 57, 58, 1, 4, 12  
server 22, 16, 17  
transaction 78  
transmission 37  
tree 6, 36, 49, 47, 50, 65, 75, 86, 91, 96, 106, 12  
type 36

## U

unattended 37, 39, 50, 72  
UNIX 2  
upgrade 5, 50, 1, 11, 73, 26, 7  
upload 46, 58, 85, 111, 112, 113, 114, 118, 14,  
15, 5, 49, 54  
user 31, 34, 35, 62, 79, 90, 100, 8  
account 10, 15, 17, 50, 30, 34, 55, 12, 13,  
16, 43, 46, 47, 48, 49, 78, 80  
Agent 61, 62, 10, 11, 12  
interface 3  
management 6, 18, 22, 30, 55, 72, 73, 79,  
83  
name 32, 34  
object 47, 2, 65

## V

value 38, 17, 76  
version 65

## W

web  
server 4, 18, 19, 20, 21, 23, 54, 5, 10, 58,  
95, 108, 6, 9, 25, 3  
services 2, 94  
write 40

## Z

zone 12, 30, 41, 50

